Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT.

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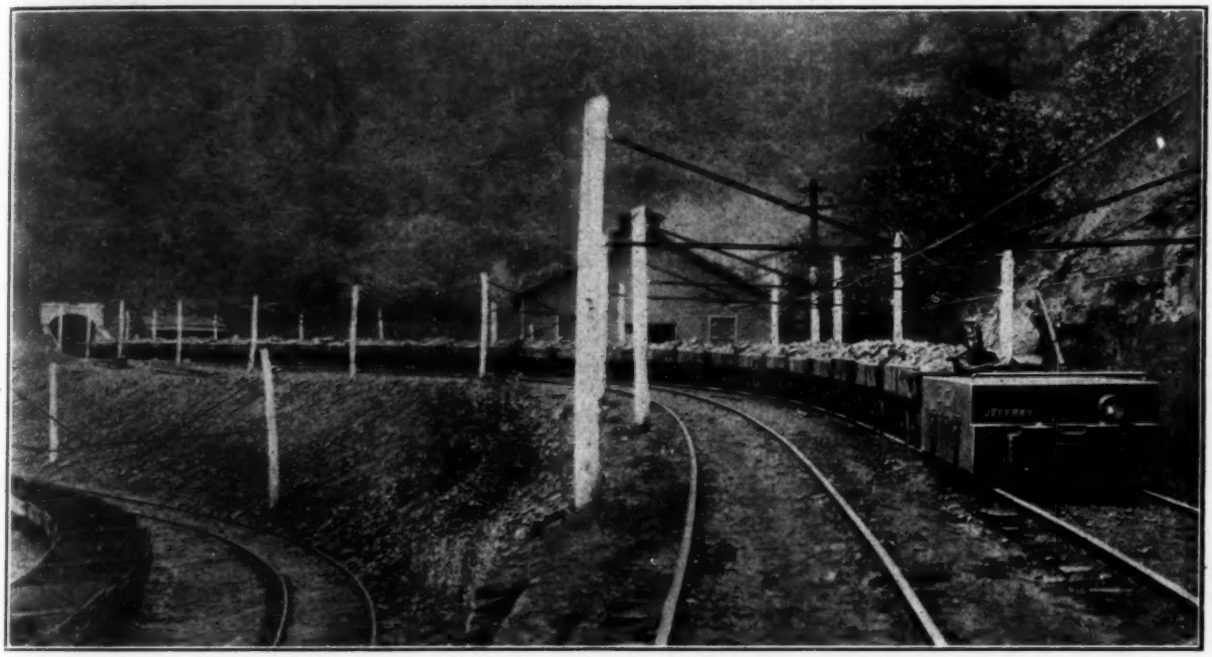


View of Haulage Locomotive Attached to Train of Coal Cars at Mine Entrance, Showing Substantial Track and Trolley-Line Construction.

Electricity in Coal-Mining Operations

Trolley Construction About Mines—Electrically Driven Ventilating Fans—Overhead and Underground Substations in Mines

By FRANK HUSKINSON

Chief Electrician, Rocky Mountain Fuel Company.

This is the second of a series of articles dealing with electric power applied to the numerous phases of coal-mining operations, including surface and underground haulage, drilling, undercutting, pumping, signaling and coal handling. The series also gives interesting facts relative to changing from the isolated power plant to central-station service. The questions of mine lighting and telephone systems and electric blasting are also given attention.

IN THE construction of trolley lines for surface haulage at coal mines, various forms of rigid, overhead supports are built to hold the trolley wire within comparatively short reach of the poles used on the electric locomotive. The rails for the main haulage lines are bound together by a short, flexible bond of copper wires riveted into the ends of the rails. In general practice several different types of bonds are used. One of the best, undoubtedly, is the concealed bond, placed underneath the fishplates where it is shielded from the danger of being cut off by the car wheels if a car gets off the track. The use of channel pins is not advised, as they are not satisfactory as a means of permanently bonding the track. However, they may be used advantageously in building temporary lines because they are cheaper and more easily installed than would be the regular bond. For the same reasons they might be recommended for small mines.

Underground trolley wires are generally supported from the roofs of tunnels and drifts, or from mine timbers. But, where the mine roof is too high, or too uneven, support for the suspended wire may be made by an attachment to an iron pipe fastened to the roof or side wall.

Some of the illustrations given in this and other

articles of this series are typical of the construction of coal-mine trolley lines, as used both on the surface and underground.

Motor-Driven Ventilating Fans.

The ventilation of coal mines is so important that provision for continuous service is essential. In modern mines this function is performed by motor-driven fans, installed at mine openings, and in some cases with auxiliary fans placed along the air courses. Electrically driven fans used comprise both the centrifugal and disk types. The centrifugal fan, as the name implies, is built somewhat like a waterwheel, having blades parallel to the shaft axle, forcing out the air at right angles to it. The centrifugal fan is the one most used for ventilating purposes. The disk type of fan has radial blades set obliquely to the shaft, and is used mostly as a booster fan inside the mine, and is generally driven by a compound-wound, direct-current motor, for which an automatic starter is quite generally provided.

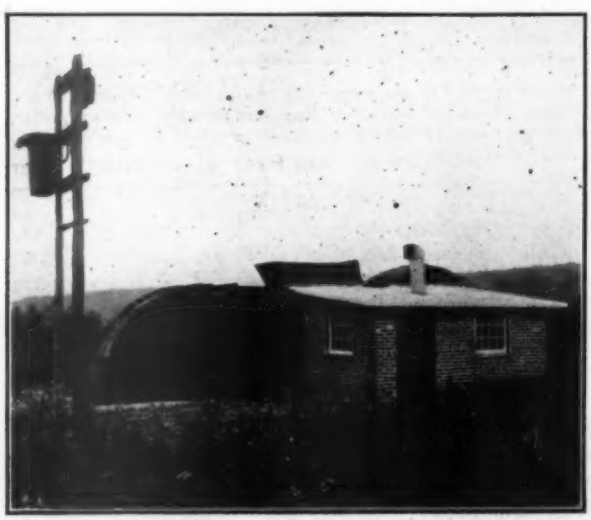
A ventilating installation at the mine opening usually consists of a centrifugal fan, belted to a three-phase, 60-cycle induction motor, with automatic starter, and supplied with alternating current from the substation, or power plant, at a pressure of 2300 volts; or it may be stepped down to 440 volts at the fan transformer. In case the fan is of a capacity requiring a 100-horsepower motor, or larger, the slipring, variable-speed motor is generally employed.

To guard against interrupted fan service in a mine, a relay motor is installed so that the fan may be connected by belt to the relay motor; also, if there is more than one source of power, the relay motor may be connected to the auxiliary source.

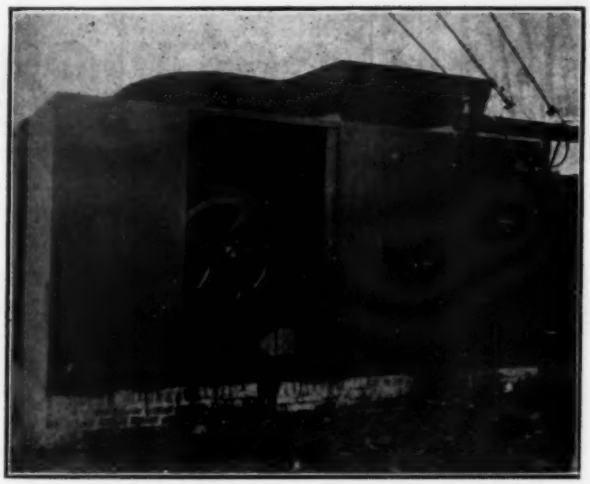
Surface and Underground Substations.

When central-station power replaces that furnished by the mine plant, the power equipment is either removed or converted into a substation. The changing over to a substation usually consists in discarding the engines and installing synchronous motors for driving the generators, whereby direct-current energy is produced for operating previously installed equipment that required direct current. This, of course, has reference to the surface substation.

For the underground substation, installed for the use and control of central-station power, it is usual to put in a rotary converter, with the necessary switch-



Housing of Motor-Driven Fan at Coal Mine.



Another View of a Motor-Driven Fan Installation.

board-control apparatus. The alternating-current power is brought to the station at a pressure of 2300 volts, through bore holes, by means of well insulated, triplex, lead-covered cables. The general practice, when making these installations, is to put in an extra set of cables; if one set gets in bad order it is an easy matter to change over to the extra set.

The underground substation is usually located at a central point, for advantageous service to trolley lines, to coal-cutting machines and other machines.

Rotary Converter Versus Motor-Generator.

While the rotary converter is the most used and the most generally accepted for converting alternating to direct current at coal-mine substations, there has been much discussion among mine electricians as to which is best for all-round use—the rotary converter or the motor-generator set. The writer favors the motor-generator set for the reason that in practical experience with both types the motor-generator set has been on the job when the rotary converter was down and out. If the supply voltage and frequency are not constant and of proper power-factor the rotary converter will not give satisfactory service; the direct current will not remain constant on a load, but will drop off as much as 20 per cent, and the rotary converter will get so hot as to melt the alternating-current taps.

A motor-generator has the decided advantage over the rotary converter in many special cases, as there is no electrical connection between the two sides of the system, and independent voltage adjustment over a wide range is possible, and the regulation is not so greatly affected by the fluctuations of the supply current. The ratio of the direct-current voltage and the alternating-current voltage in a rotary converter is practically a fixed quantity, and this is a serious disadvantage where it is desirable to have the direct-current voltage at the machine increase with the load, so as to keep it constant at some distant point.

Adjusting the field strength of a rotary converter changes the phase-angle of the current. This permits to a certain extent correcting for low power-factor. As long as the power-factor is approximately 98 per cent leading or lagging, the rotary converter will give satisfactory results, but for overloaded circuits I prefer the motor-generator set. The rotary converter will carry overloads equally as well, providing the power-factor is high; on the other hand, the motor-generator will carry the overloads even if the power-factor is very low.

Publicity Problem of Electrical Dealer

Second Installment of Article Telling of Publicity by Personal Contact, Mail, Personal Canvass and Newspapers—Cashing-in on Central-Station Publicity — Co-operative Advertising

By CHESTER A. GAUSS

THAT a special window-display man or the part-time services of a window-display man cannot be afforded by the average electrical dealer is no excuse for haphazard displays. Window-dressing talent can be developed. The responsibility of dressing the windows should be placed on one man, who should make a diligent study of the subject. It is by constant practice that ability is acquired. If one clerk dresses a window one time and another the next time, neither will acquire any real ability.

It is not always the most elaborate or expensive window that sells the most goods, nor are expensive fittings required for attractive displays. The idea in back of a display has much to do with its effect. Brains count most in window advertising as in other forms of advertising. The window that gives the passer-by some one idea to carry with him is best, for it is some one idea carried through a display that causes people to think of it afterwards. A heterogeneous mass of material and appeals is no more effective than an advertisement looking as if it were a patch quilt. Aim at simplicity, not complexity, in all advertising. Make extensive use of the window-dressing material and aid furnished by manufacturers. Try to improve on the ideas that they suggest.

Never show defective or dirty goods. Goods on display are supposed to be typical of those shown on the counter. Tie your window displays up with your other advertising, such as circularizing, space advertising, etc. It will make both your windows and your advertising pay better. Showing the goods is what sells them. By displaying advertised goods in your windows people can see how they compare with the descriptions of them that you have given.

Your window is idle whenever the curtains are down or the goods are out. Don't let your windows be an idle investment for one moment longer than absolutely necessary to change displays. The displays should be planned as far as possible in advance so that they can be set up in the minimum time. Windows should be dressed in the very early morning or late at night, when there is little or no traffic.

Very few window fittings are required and those that are required can be purchased cheaply. A number of good clean bricks and a quantity of cigar boxes of uniform size will come in very handy in setting displays. Use display and price cards freely, as the giving of prices helps to sell goods. Save all your cards after being used as they can be cut down and reprinted.

Don't think that one window painting or one background is sufficient. Change the setting, the backgrounds and hangings frequently as well as the goods. It will be a new attraction for the passer-by.

Have a regular place to store all show-window material. Most of the material can be used over and over again.

In designing displays try to get motion into them. An infinite number of opportunities for doing so are offered where electrical goods are displayed. But don't let the motion distract the attention of passers-by from the actual goods that you are displaying. In other words, be careful about using freak ideas that will merely attract attention to themselves, but will not sell the goods on display.

Publicity Through Personal Contact.

If a retailer expects to succeed in business he should not only see to it that his store becomes well-known in the community but that he, himself—the man behind the store—is well known. People like to do business with men that have some standing in a community and men who play an important part in furthering its welfare. The electrical dealer should, therefore, take an interest in city affairs, join its business men's club and be active in all things tending to promote the welfare of the community. This will serve to give the electrical dealer a large acquaintance and will cause him to be recognized as one who is not merely seeking to make a living off of the community but is also interested in furthering its welfare.

Press Articles and Free Reading Puffs.

As was said at the beginning of this article, publicity is too often looked upon as free reading puffs. Although publicity is often viewed in this light, the so-called free-reading puffs are generally of little or no publicity value. Any press article that is plainly written not for its news value, but to further some selfish advertiser's aims or to secure advertising for a paper, is of absolutely no publicity value. Although such an article may be read and believed by the ignorant, it will repel the attention of the type of customer that the electrical dealer wants and will often create a very unfavorable impression. Whenever an electrical dealer has an article of real news value that will interest the readers of the local papers he should by all means request its publication. Newspapers are glad to get such material even from non-advertisers. The truth should never be exaggerated in such articles. Unless all of a dealer's advertising and publicity is based on the truth, his business is not founded on a firm foundation, as the true facts will sooner or later be learned by the public, causing a dealer's word to be questioned on all things in the future.

Direct-by-Mail Publicity.

Before engaging extensively in the use of direct-by-mail publicity, the electrical dealer should attempt to learn clearly and definitely the territories from which he may expect business.

Most electrical dealers are engaged in the electrical contracting business and the market that they have found for the sale of their contracting services is, of course, an excellent market for the sale of appliances. But the electrical dealer should attempt to seek a wider and broader market for his appliance business by analyzing and studying his possible markets. By

doing this he will also be enlarging his market for his contracting work as the electrical dealer should not overlook the fact that the sale of appliances opens the way to sales of baseboard outlets with the necessary wiring, etc.

In a large city with a large centrally located store, the entire city represents a market for the electrical dealer, if all sections use electrical energy. If an electrical dealer's store is not centrally located, he has, of course, the entire city as a market for his wares, but it would pay him to consider whether or not specialization in this section in which he is located would not be desirable. In a small community the electrical dealer often has to look beyond the confines of his own community to find a market large and good enough to justify his engaging in the appliance business. Before doing any circularizing the electrical dealer should hence make a careful analysis of his territory or market and should carefully study the results secured from all circularizing efforts so as to be able to concentrate on those markets for his goods that will give the greatest returns at the minimum expense.

After the electrical dealer has analyzed his market he should prepare his mailing list from his list of customers of his contracting business and from such lists of wired houses as he may be able to obtain from the local central station. In a small town the names of tenants of wired houses can be obtained by having boys supply this information. Where the boys do not know the names of occupants of certain houses, the desired information can readily be obtained from others. In towns or cities where the use of electricity is general, the telephone directory is an excellent source from which to compile a mailing list. All names should be carefully considered, as each name will involve a considerable outlay for postage and stationery.

Having compiled his mailing list, the electrical dealer should put it in card-index form, devising a system whereby he can keep track of the appliances sold or already in use by each name of the list. The electrical dealer should also keep accurate records of the inquiries and sales resulting from each letter. This will enable him in time to determine just what appeals bring the best results.

Good, plain, sensible and forceful letters should be used. These should open with some definite appeal that will arouse the interest of the prospect and should be written from the customer's point of view. Every letter should have a definite purpose which should not be departed from anywhere in the letter. If the dealer is trying to sell electric irons, he should tell the customer in his letter what an electric iron will do for her—how it will remove the drudgery from ironing day by saving steps, reducing the labor and eliminating the necessity of a hot fire on a summer's day. The price of the irons should, by all means, be given. If possible, attractive terms should be made wherever one is trying to sell expensive appliances, such as washing machines or vacuum cleaners.

All inquiries should be given prompt attention and conscientiously followed up. Much business is lost even by large firms through slipshod methods of taking care of the very inquiries they are seeking to promote.

Small folders describing the goods offered can generally be secured from manufacturers free of charge, thus eliminating the cost of having one's own folders printed. In order to impress one's individuality upon the prospect, the dealer should insist that his name, trade-mark and slogan be imprinted prominently on such material and that they be printed in his own distinctive type or from his own electrotypes.

Don't stuff a letter with a lot of folders. Just one folder describing the goods offered in the letter is necessary. Too much literature confuses the mind of the prospect. Each letter and its inclosure should be devoted to attempting to promote the sale of some *one* article.

Books on circularizing, of which there are many, should be carefully read when starting circularizing for the first time and constantly referred to when sending out subsequent letters. Although such books will give some guides in regard to whether letters should be sent sealed and whether or not addresses should be filled in and pen-and-ink signatures given, experience is one's best guide. In this connection, however, it may be well to mention that at least one central station has a unique method of overcoming the "circular" effect of a one-cent stamp. By using especially attractive envelopes, generally tinted so as to appeal to women, it is found that letters sent under a one-cent stamp yield exceptionally good results. In fact, the results secured are so good as to cause this central station never to use the two or three-cent rates.

Don't be content with the returns you get from a single letter. At least three letters trying to sell the same one device should be sent to prospects. The appeal, however, should be varied in all cases. A letter that will appeal to one person may not appeal to another. In following up letters, don't send letters and literature at equal periods of time. It is important that the initial impression created be strengthened within a short time after the first letter is sent. The interval between the second and third letters should be longer, the interval increasing as more letters are sent.

Try to have your letters reach prospects at an opportune time. It is not advisable to send out letters so that they will reach customers on the first or fifteenth of a month, as these are days upon which bills are received and expenditures more carefully scrutinized. Letters reaching a housewife on Saturdays are not likely to produce the best results in that this is her busy day.

In circularizing prospects during these war times, don't overlook the appeal that can be made based on the scarcity of labor. Point out to the housewife how she can dispense with the servant problem, when servants are hard to secure, by doing her own work electrically—with very little more work or trouble on her part.

Personal Canvass.

Although electrical devices all serve a useful purpose and add to the comfort, convenience and happiness of the homes in which they are used, it requires more than the usual sales effort to do an appreciable business in the larger and more costly devices, such as vacuum cleaners, washing machines, lighting fixtures, utility motors, etc. Although these devices do much towards lightening the labor in the home, their true worth is seldom appreciated until actually used. The obvious way to overcome this resistance is to put these appliances into the hands of the housekeeper—to let her try them and to let them sell themselves. However, if a store merely advertises that it will send a cleaner or washing machine on free trial, the requests for demonstrations will be comparatively few in number. Prospects must be approached personally—that is, by personal canvass—if a considerable business is to be done in these appliances.

In order to push the sale of such appliances properly, facilities must be provided for getting in touch with prospects personally, for demonstrating these appliances in the home, for leaving them on free trial and

for closing the sale. This necessitates having a live-wire salesman to follow up the electrical dealer's advertising and publicity by personal canvass. It does not mean, however, that the electrical dealer must necessarily maintain a large stock of such machines. When propositions of this nature are undertaken it is best to make them the subject of a special drive extended over a limited period. In such cases special arrangements can generally be made with manufacturers whereby they will supply the necessary stock of machines and take back any that remain unsold at the end of the campaign.

By having periodic special sales of this nature for vacuum cleaners, electric washers, lighting fixtures, electric irons, electric fans, radiant heaters, etc., the time of such a salesman can be well employed. Between campaigns he can canvass for the sale of coffee percolators, toasters, and other devices which cannot very well be offered on the free-trial basis, as well as for the sale of special wiring for baseboard outlets, etc.

Newspaper Advertising.

Let us now consider the forms of advertising involving the buying of space in what are commonly called advertising mediums. Of these perhaps the commonest is newspaper advertising. Whether or not an electrical dealer should advertise in local papers depends upon the size, location and financial condition of his business as well as the size of the town and the circulation distribution of the local papers. Before advertising in local papers the dealer should analyze his present market and determine if he can hope to attract trade from more distant sections of the city. He should then figure what relation his total possible market bears to the total circulation of any papers he is contemplating using. In this way he can obtain an idea of just what it will cost per prospect to reach the market he has in mind through newspaper advertising and whether or not these prospects can be reached at lesser cost in some other way.

In a small town and with a centrally located store there will be very little, if any, waste circulation when advertising in the town's local paper. On the other hand, in a large city, such as New York, with a store located in such a section as the Bronx, the electrical dealer cannot hope to attract trade from the more populous sections of the city and, hence, cannot use the large New York dailies to advantage. Although such papers will reach the prospects in his own territory, these papers are also read by a great number of people whose trade the electrical dealer in the Bronx cannot hope to obtain. Yet the electrical dealer would have to pay for this waste circulation, making the cost of reaching a prospect prohibitive.

If newspaper advertising is undertaken, advertise regularly. Where spasmodic advertising methods are used, the advertiser in periods of little or no advertising is *wasting* a large part of his previous advertising investment. Such an advertiser merely promotes, at the best, spasmodic sales, his gross sales for a year or period of years being much less than if he had invested the same amount of money in continuous advertising on a smaller scale rather than on a few large splurges that are soon forgotten..

Large space is not necessary in newspaper advertising but the "business-card" type of advertising should not be used. An electrical dealer is selling electrical goods and should feature some of their advantages in his advertising rather than merely his name. Pictures of seasonable appliances should be used where possible as pictures attract attention. Manufacturers of appliances will be pleased to supply the necessary cuts. The copy should always be written from the customer's point of view and should be interesting. Copy should be changed frequently enough to keep the readers' interest alive, but a few parts of all advertisements should remain unchanged except in position. These parts are the dealer's name, trade-mark and slogan, which should always appear in the distinctive type that the dealer has decided to use. In this way the dealer's name, slogan and trade-mark will become firmly impressed upon the buying public through repetition. Moreover, they will always give to the dealer's advertising an individuality that will distinguish his advertisements from all others just as he wishes his to be known by its individuality.

When writing his advertisements the dealer must remember that white space is as essential as type matter and, therefore, should not crowd his space with fine solid type. White space, type matter and illustrations should be so proportioned as to yield a result that not only is pleasing to the eye but, if possible, even attracts favorable attention and *holds* it. Freak make-ups will generally attract attention but they do not hold one's attention. They should, hence, never be used.

The type used should be easily readable and only two or three sizes should be used at the most. A multiplicity of sizes and especially a multiplicity of type faces makes an advertisement difficult to read and hence greatly reduces the chance of such an advertisement being read. Newspaper offices should be consulted about the best typical arrangements to be used unless the dealer himself has a good knowledge of advertising.

Cashing-in on Central-Station Advertising.

Many central stations are more than anxious for electrical dealers to co-operate with them in furthering the sale of appliances, even going so far as to mention dealers' names in their advertisements. When special sales are held by the central stations they often arrange with electrical dealers to sell the advertised goods at special prices, the central station paying the dealer the difference. The electrical dealer should co-operate with the local central station to the fullest extent possible, tying his newspaper advertising up where possible to that of the central station. In small towns where there are but one or two electrical dealers, they should attempt to perfect some arrangement with the local central station whereby the dealers' names will also be mentioned in the central-station advertisements.

Co-operative Advertising.

One individual or one store cannot bring about reforms or change buying habits as easily, quickly or cheaply as can a group of individuals or stores having a common interest who pool their endeavors for the good of all. It is this idea that is back of every trade association and it is this idea that is back of the co-operative advertising that is being done by various interests today. Co-operative advertising, however, has not been used in the retail speciality field and especially in the retail electrical field as extensively as its value and importance warrant. In co-operative advertising the electrical dealers of a community have one of their most powerful means of counteracting the effects of department-store advertising and publicity.

Co-operative advertising may or may not appear over the names of the firms contributing towards it. In the case of electrical-dealer co-operative advertising, however, the names and addresses of all stores contributing towards it should appear. The amount to

be contributed by each dealer depends primarily upon the gross amount of business done and upon any uneven distribution of returns that are more or less self-evident.

By pointing out the advantages of doing all of one's electrical shopping in electrical stores, such co-operative advertising will go a long way towards not only meeting non-electrical store competition but also towards bringing the bulk of the trade to the electrical stores. It is a powerful sales stimulator that no group of local electrical dealers can afford to overlook and one which deserves their hearty co-operation. Many apparent obstacles may present themselves when such a scheme is put before the electrical dealers of any community, but these obstacles are more apparent than real. It is true that it may be difficult to secure the co-operation of all the electrical dealers in a city, but the few "slackers" can be overlooked. They will derive some benefit from such advertising but not as much as if they lent their support to it. On the other hand, those dealers contributing towards such co-operative advertisements will receive greater benefits than they could obtain by advertising individually with the same investment and can, hence, well afford to let the "slacker" have part of the surplus benefits.

Miscellaneous Paid Advertising.

Among the other forms of paid advertising that can be used to advantage by the electrical dealer are motion-picture slides, billboards, posters and street-car cards.

The cost of displaying motion-picture slides is not great. Manufacturers will gladly supply the slides as well as films on electrical subjects in some cases.

Posters, billboards and street-car cards are also relatively inexpensive. These forms of advertising differ, however, from newspaper advertising in that their messages must be conveyed by a few words or preferably by the illustrations themselves. There is little room for text matter. Even if room were available for "copy," text matter could not be used to advantage in that these forms of advertising are not seen under conditions that invite the necessary close and prolonged attention required to read text matter.

Success Dependent Upon Knowledge of One's Own Business.

In conclusion, it may be said that the success of any retail business is limited only by one's ability to analyze the conditions and forces at work in his own business and to see and interpret correctly the forces and conditions at work in business in general. No greater aid is offered in this connection than that which is given at small cost by the electrical papers and the prominent business magazines. Through the reading pages of electrical papers, the electrical dealer can obtain true and accurate reports on trade conditions as well as many valuable advertising, sales and merchandising ideas that have won success for others. But more than the reading pages of such magazines deserve attention. The advertising sections will give the dealer information about the products which he is selling and will also keep him posted on new developments and new devices.

The prominent non-specialized business papers should be read with almost equal diligence. In them are given ideas that have been used with success in other lines of business—ideas that in many cases can be applied with equal success to the electrical dealer's own business.

Articles giving advertising, selling and merchandising ideas that have won success for others should be clipped and filed for future reference. The electrical dealer who will not take the time to do such reading and clipping is gradually losing his hold upon his business and is placing himself at the mercy of his more progressive competitors.

Adopt Specialty-Store Methods.

The building up of a successful appliance business in competition with department stores and other stores selling electrical appliances as a side line is not surrounded by insurmountable difficulties nor by entirely new merchandising problems. Neither is the task of giving one's electrical store its needed publicity a difficult one. The electrical dealer has a number of advantages over the department store. He can offer better and more personal services. He knows his goods and his trade better than does the department store and is, hence, better able to cater to his customers' wants. The bulk of his trade is permanent, not transient. Finally, but not least, he can do business as cheaply, if not cheaper, than can the department store.

With these advantages, the electrical dealer has only to apply those methods that have won success for a host of grocery stores, clothing stores, jewelry stores, etc., who, like the electrical dealer, must meet the competition of the department store. His business, like that of all successful specialty stores, must be founded upon the solid bedrock foundation of service. If the electrical dealer founds his business on such a foundation he has within his reach the greatest of all publicity mediums—the means for establishing for his store an individuality that will distinguish it from all others—an individuality, a prestige, a good name, that is so impressed on the buyer or prospective customer that he would hardly think of buying elsewhere.

WAR INDUSTRIES ABSORB POWER AT NIAGARA FALLS.

Plans for Enlarging Hydroelectric and Steam Plants—Good Results of Power Regulation.

The war industries are utilizing practically all the available power produced at Niagara Falls, including that generated on the Canadian side as well as that on the United States side. It is announced by the War Department that war industries absorb an average of 85.29 per cent of the power produced by the Hydraulic Company and the Niagara Falls Power Company, and of that generated by other co-operating companies they use an average of 54.29 per cent. Those industries, it is estimated, could advantageously use 200,000 additional horsepower if such supply were available. It is proposed to supply a part of this shortage by the enlargement of the steam plants of the Buffalo General Electric Company and the Niagara, Lockport & Ontario Power Company. The increase of power by the proposed changes in those plants will amount to 62,000 horsepower. Other American hydroelectric companies, now producing 250,000 horsepower at Niagara Falls, are to so enlarge their facilities as to give them an additional capacity of 160,000 horsepower.

The Fuel Administration's co-operation has been secured with the view to maintaining an adequate fuel supply for the important auxiliary steam plants in the vicinity of Niagara Falls.

The beneficial results of regulating power distribution have been demonstrated by the system of power allotments put in practice in that district, especially as regards plants producing such essentials as ferro-silicon, electrodes, phosphorus, chlorine and abrasives.

Improved Lighting of Meat-Packing Plants

Rapid Development of Industry Accounts for Failure to Keep Up With Lighting Progress—Plant Lighting Capable of Much Improvement Both as to Natural and Artificial Light—Benefits to Be Attained Thereby

By F. H. BERNHARD

This is the third of a series of twelve articles on improvement of lighting in as many industries. These articles emphasize the desirability of improving industrial lighting to meet present heavy demands and those to come after the war. The benefits of better lighting are set forth in a non-technical way so they may be brought to the attention of factory owners, managers and superintendents, very many of whom still have but an imperfect realization of the importance of good illumination to their industries.

FOOD is the primal need of the human family, as it is of all animate beings. The supply of food is always of vital interest to every man, woman and child. During these abnormal times when we are called on to feed not only our own hundred millions of people but many millions overseas, the production of food has risen to such predominating importance that upon it is dependent the outcome of the greatest war in history. General acceptance of the truth of the saying, "Food Will Win the War," is shown by the readiness and loyalty with which our people are accepting wheatless and meatless days in order that we may properly feed our rapidly increasing army at the front and help feed the armies and civilian populations of our Allies. In view of this extraordinary importance of food, anything that has any bearing on the quantity, quality or cost of its production is of special timely interest just now.

Meat has been a staple article of food from prehistoric times and remains so today in spite of the pleadings of vegetarians. We Americans are exceptionally large consumers of meat, to which is sometimes ascribed our characteristic energy. It is to American intiative and energy that the conversion of cattle from the farms and plains into wholesome meat ready for the market has been completely revolutionized within less than half a century and developed into a highly specialized industry noted particularly for its efficient utilization of by-products. So rapid has been the development of the meat-packing industry that in some respects it has not been able to keep pace with developments in contemporary lines of

Fig. 1.—Reef Cooler in Chicago Plant of Armour & Company. Excellent Illumination From Mazda Lamps Equipped With Opal Glass Reflectors. White Ceilings, White Glazed Brick Walls and Sawdust on Floor Enhance the Lighting Effect.

which it might well have availed itself with considerable profit.

Light in superabundance has been thrown on the industry in numerous investigations by various boards, commissions and individuals, and yet the industry is in need of more light. What it needs is physical light, however, improved illumination in and about its manufacturing plants. These plants show evidences of the adoption of many progressive ideas that increase the efficiency of production, but they have been backward, as a rule, in taking advantage of developments in scientific industrial illumination. There have been several reasons for this, of which what seem to be the chief ones will be briefly outlined.

Rapid Development of Packing Industry Results in Neglect of Lighting.

An extraordinary contrast is presented by the brutal and wasteful methods of slaughtering cattle used by the old-time butcher and the humane and efficient methods employed in a present-day meat-packing plant. The old butcher had no conception of modern ideas of cleanliness, nor had he the least conception of the manifold uses that could be made of many parts of the carcass that had no immediate value as marketable meat. The insanitary conditions of the old butcher's shop, which in many cases amounted to a public nuisance, led to the restriction of slaughtering to districts beyond the inhabited parts of cities where the packing industry had its crude beginnings.

It is to the credit of the more progressive pioneer packers that they had farsightedness enough to see that the concentration of slaughtering and meat preparation in larger plants would permit not only more efficient operation, but development of new meat products and conversion of the non-edible parts of the carcass into useful materials of various kinds. The services of the industrial chemist were secured and through his research the former wastes were turned into such varied and valuable products as medicinal extracts, glycerine, gelatine, glue, soap, curled hair, fertilizer and a great many others. This development represents probably the most important achievement in utilizing by-products in any industry.

At the same time there were being brought out many new food products and others already well known were put into less perishable form so that they could be shipped into distant markets and reach the consumer in the original, sanitary package prepared by the packer. This meant the establishment of an entirely new branch of the business—the canning departments. The public little realizes what it owes to the initiative and enterprise of the packers through the developments in these two lines alone—the by-products representing new or additional supplies of useful materials and serving to keep the price of meats from increasing as fast as the cost of live stock—the new meat products and additional forms thereof increasing the variety of foods available and bringing them to markets that had enjoyed but scanty supplies of wholesome meats.

Fig. 2.—Same Cooler Shown in Fig. 1 Filled With Prize Beef. Flashlight Used to Shorten Photographic Exposure. This Does Injustice to the Uniformity of Illumination Actually Prevailing.

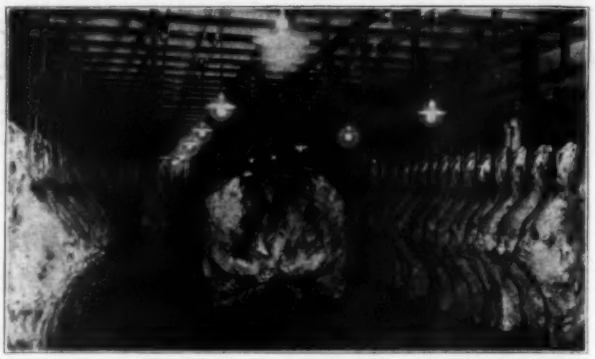


Fig. 3.—Beef Cooler in Another Chicago Plant. Flashlight View. Lighting Could Be Improved by Higher Mounting of Units, Use of Deeper Reflectors and Frosted Lamps and Light-Colored Walls.

To make these developments commercially feasible meant extension of the packers' activities in many directions, both in the creation of efficient new departments to manufacture the new products on a commercial scale, and in the efforts to market the output at a reasonable profit. A conception of the diversified character of the packing business may be obtained from the statement of one large company that produces 1200 different products marketed in over 3000 different packages or forms. To keep down manufacturing costs and prevent shipping delays, many of the larger packers also established auxiliary departments for making their own tin cans, cartons, packing boxes, repairing their refrigerator cars, etc.

It is evident that the establishment of so many new departments, all of which had to be provided for without interfering with the regular slaughtering business and in many cases in comparatively congested packing-house districts, made the building problems numerous and very complicated. The industry itself, on account of its many diversified activities, is a very complicated one, and even in the comparatively new packing plants the layout of the buildings and routing of the products through their various stages of manufacture is by no means simple.

From the foregoing hasty review of packing-plant development it is easy to see that the construction and operating departments of the larger companies have been extremely busy in meeting the changing needs of a rapidly expanding business, so that some features of plant equipment, such as lighting, naturally have not been given the importance that they deserve.

Another reason is that lighting has been considered by some to be necessary only to the extent that it enables the employes to get about the plant and do their necessary work, and that anything beyond this or which aims at efficient and effective illumination is in the nature of an unwarranted refinement. Since most of the packers need considerable steam about

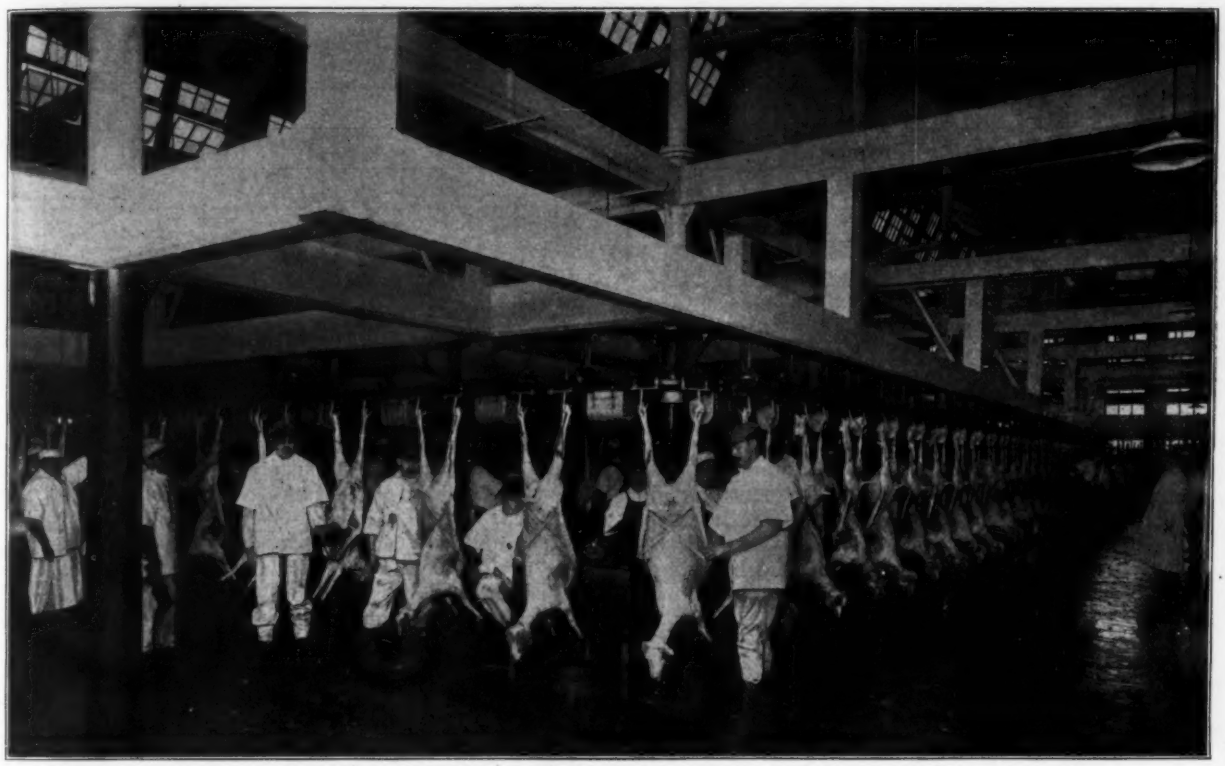


Fig. 4.—Daylight View in Sheep Killing and Dressing Department, Armour & Company. Good Daylight Illumination From Saw-Tooth Roof and Large Windows. Artificial Lighting From Mazda Lamps Equipped With Porcelain-Enameled Dome Reflectors.

their plants, they have usually provided their own electric generating equipment; consequently the question of efficiency in lighting has been looked on as of minor importance, and as for any refinements of course no one has expected much in this line about a slaughtering establishment.

Still another reason rises from the labor problems of the packing industry. In many of its departments the work is not very desirable for olfactory and other obvious reasons, consequently it has been found necessary to employ less discriminating workers, chiefly foreigners. These are not critical as to lighting conditions, and, even if they were, probably would not know how to express themselves in the English language. An entirely different class of workers is found in the offices and their needs and desires as to lighting are usually met very satisfactorily.

Lighting Conditions Now Generally Poor.

It is believed that the foregoing and what follows are fair and frank statements of the facts. Quick to avail itself of the latest scientific developments in many lines, particularly organic chemistry, the meat-packing industry has remained one of the very few large industries that have not adopted to any great extent the very important improvements in industrial lighting made possible by the rapid progress in illuminating engineering in the last ten or dozen years.

That the lighting, even in some of the newer plants, is far from being what it might be is acknowledged by some representatives of the packers who candidly admit that the lighting now provided in the manufacturing departments is by no means up to modern standards.

Inspection of typical plants fully bears this out. Except in the newest buildings, even the daylight conditions are unsatisfactory. The old buildings are largely of mill construction with low ceilings, heavy timber beams and many columns, thus obstructing what daylight enters through the small and infrequently washed windows. On account of the relatively large extent of the floor space so little daylight penetrates into the spaces away from the windows that artificial light has to be employed very extensively even on bright, sunny days. Small interior rooms and many stairways and passageways are frequently almost entirely without daylight, thus presenting pitfalls for serious accidents. In some of the more recent buildings, especially those of concrete construction, daylight conditions are generally much improved, the rooms being higher, the windows larger and the columns fewer.

As regards the artificial lighting equipment in use, it is for the most part of antiquated type. Carbon-filament lamps are still used in quite a few places, although known to be inefficient. Bare, glaring lamps are used quite generally in very many parts of the plants. Where reflectors are employed they are most commonly of the cheap conical tin shade form. As a whole, the lighting equipment consists, as stated by a packing-house engineer, of a miscellaneous aggregation of lamps, fixtures and shades, bought at various times chiefly on the basis of price, and kept in service till they burn out or fall to pieces. There are noteworthy exceptions to this, especially in the general offices, lunch rooms, inspection sections, wholesale markets, refrigerator rooms, and the engine rooms of power houses. In the newer buildings the artificial lighting is also of a higher type than the average in the rest of the plants. In plants of the smaller packing companies the lighting conditions, both natural and artificial, are almost invariably much worse.

In very few places in the packing plants is there evidence of systematic planning of the lighting system such as one finds now in so many progressive industrial establishments, where the management has recognized the importance of abundant, well directed and efficient lighting. The packers have been engrossed

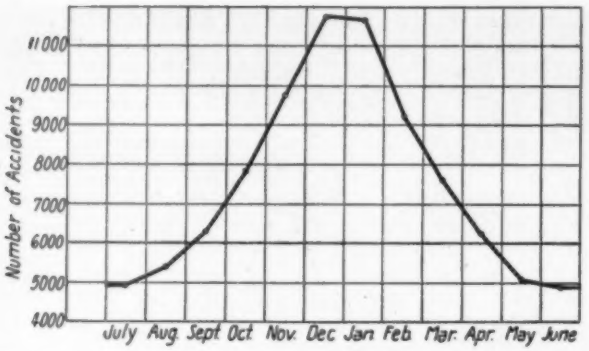


Fig. 5.—Curve Showing Monthly Distribution of All Industrial Accidents Reported to a Large Insurance Company.

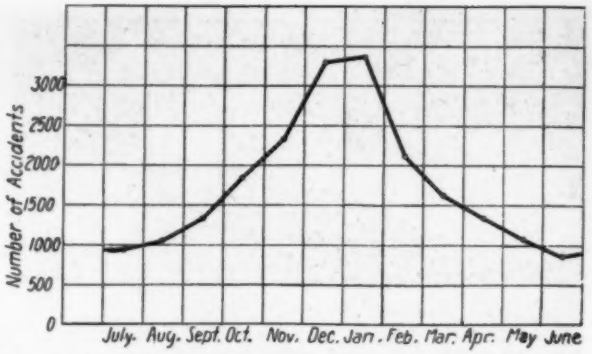


Fig. 6.—Monthly Distribution of the Accidents Ascribed to Inadequate Lighting.

in such a great variety of problems that they manifestly could not give much study to illumination; furthermore, the matter has not been frequently brought to their attention. It may be appropriate, therefore, to briefly point out the principal benefits of improved industrial lighting that would be realized by this particular industry.

Advantages Derived from Improved Lighting.

The advantages obtained from improved lighting have been frequently discussed, and are fairly well known by those that have made a study of the matter. As regards the packing industry the principal advantages may be listed as follows, approximately in the order of their importance.

It promotes cleanliness.

It reduces accidents.

It minimizes eye-strain, makes more cheerful workrooms, and increases the contentment of workers.

It decreases spoilage and improves the quality of the work done.

It increases the output with no increase in the labor cost.

Cleanliness.—It is of course evident that in any plant handling or preparing food products, cleanliness is of utmost importance. That this is realized is shown by the great attention given to this matter in the plants of the more progressive packing companies. Instances of this are as follows: Rules compelling employes that actually touch or handle the meat to thoroughly cleanse their hands before beginning work; in many departments a manicurist is employed to insure that this is properly done. By Government regulation the floors of all departments where the cattle are slaughtered or where the meat is prepared for the market must be thoroughly scrubbed after each working period.

Notwithstanding these precautions, it is evident that if the lighting is meager in any portions of rooms or passageways, the cleaning cannot be as thorough as would be the case under an abundance of light. Moreover, it is much easier to make the inspections as to cleanliness when ample light is furnished in all portions of the premises.

Accidents.—The relation of lighting to accidents has been given a great deal of consideration and study by accident-insurance companies, safety experts, and inspectors of state industrial commissions or factory inspection departments. It has been observed by these experts that industrial accidents increase greatly during the winter months, which evidently is due to the shorter days and the increased employment of artificial light which in many instances is still entirely inadequate and far from equivalent to daylight. A graphic illustration of this fact is shown in the curve of Fig. 5, which gives the monthly distribution of about 91,000 industrial accidents reported to one of the large industrial insurance companies during a typical year before the war. It will be noticed that the total number of accidents for December is something like 135 per cent greater than those in June. In Fig 6 is given the monthly distribution of accidents that were reported for the same year as being clearly due to inadequate lighting and which could have been prevented by plenty of light. In this it is seen that the accidents in winter reported as due to poor lighting are three to four times as numerous as those in summer from this cause. Of course, it is evident that during the summer months also accidents are caused frequently by inadequate lighting in many parts of plants. If this were not the case the summer total would be extremely small. The report states further that of the accidents reported as due to other miscellaneous causes no doubt a considerable number could have been prevented by improved lighting.

While no definite statistics are available regarding the occurrence of accidents in the meat-packing industry, it is evident that in spite of efforts to inculcate the "Safety First" idea among the employes a large number of accidents do still occur. Practically every plant has its own first-aid and surgical facilities, for promptly taking care of injured workers. As to the reasons for the prevalence of accidents in any plant, of course it is well known that carelessness and negligence are very important factors; on the other hand, dark stairways, poorly lighted passageways, and other places where gloom abounds are the source of a great many accidents from falling. The lighting committee making an investigation of the lighting of factories for the British Government, discovered that under arti-

Fig. 7.—Beef Killing and Dressing Department in a Chicago Plant. Good Daylight Illumination From Skylights. Artificial Lighting From Numerous Arc Lamps. These Have Been Replaced (Since Photograph Was Taken) by the More Efficient and Steadier Mazda Lamps.

Fig. 8.—Loose-Wool Storage Room in Large Plant. To Prevent Halation, Photographer Has Temporarily Placed Paper Shades About Each Bare Pendent Lamp in Center of Aisle, Thus Securing the Good Diffusion Shown. The Glare Usually Present Requires Some Permanent Diffusing Medium, at Least Frosted Lamps.

ficial light there was an increase of 71 per cent in accidents from falling compared to the number under daylight. This committee reported further that for accidents from all causes the rate is 29 per cent higher under artificial light than under daylight. The estimate of American safety experts is that about 25 per cent of all industrial accidents are due directly or indirectly to poor lighting.

In the older buildings used in the packing industry there are many poorly lighted passageways and stairways which account for very many ordinary accidents from falling, and in case of sudden fire or panic would probably be the cause of serious loss of life.

Working Conditions.—Eye-strain from poor lighting is very common among industrial workers, especially among those engaged in such occupations as require close visual work. While in the packing industry the number of such occupations is not very great, nevertheless, inadequate lighting is objectionable even here from this standpoint. Another disadvantage of poor lighting is that it makes rooms look rather gloomy and certainly uncheerful places of employment. It has been found that improvement of the lighting makes a much more cheerful atmosphere in which to work, and that along with diminishing of accidents and eye-strain it makes for greater contentment among the workers.

Quality of Work.—The quality of work is greatly affected by the amount and kind of lighting provided. It is of course evident that poor lighting must result in less attention to detail than proper lighting, and actually is the cause of much spoiled product. While the number of operations in the actual handling of meat products that require close attention to detail is not very large, in those operations where this is an important matter improved lighting must result in material improvement in the work.

Increased Production.—In practically every plant, regardless of the kind of the industry, in which lighting on modern lines has been installed, there has been found an increase in the output with the same number of employes and the same labor cost. A number of reasons contribute to this, among which are: Decrease in loafing, closer supervision, reduction of spoiled products, and, most important, a general speeding up due to the fact that it is much easier to perform the work in hand when an abundance of good light is furnished. In different industries the amount of increase of output following installation of modern lighting has varied from 2 to 10 per cent or more, this depending upon the importance of light in carrying on the work.

To what extent improved lighting would increase the output in a packing plant it is very difficult to say, in the first place on account of the great variety of operations, and in the second place on account of the number of those in which the output depends not on the individual work so much as upon the average of an entire room full of workers who operate as a unit. It is believed, however, that even in this latter type of department a speeding up of a few per cent at least is easily possible through improved lighting. If this can be attained the cost of the lighting will easily pay for itself in a short time on account of this increased output. Surely at the present time when every effort is being made to increase the output of all industrial plants producing the urgently needed supplies for our army as well as for the armies of our Allies, most careful consideration should be given to the possibility of improving the production rate by better lighting.

Cost of Lighting Very Low.

Although the cost of lighting varies in different industries due to the varying importance of light in the conduct of the individual plants, it is known to be a very small part of the total production cost. Not often does the cost of lighting average as much as one per cent of the labor cost, and by cost of lighting is meant all costs connected with the providing of light, such as interest on the investment in lighting equipment, cost of current for lighting, cost of cleaning and maintaining equipment, etc.

Fig. 9.—Inspecting Beef in Plant of Swift & Company. Good Illumination Furnished by Lamps With Reflectors Placed Behind and Above Each Government Inspector.

Fig. 10.—Wrapping Oleomargarine. Good Daylight but Unsatisfactory Artificial Light From Bare Lamps. Dome Reflectors and Bowl-Frosted Lamps Recommended.

In plants where electric power is used the amount of energy required for the lighting is seldom more than ten per cent of that required for electric power. The cost of an improved system of lighting compared to one that is in service should be very little greater, because by adoption of the improvements made possible by the progress in the illuminating art it is usually possible to secure a much higher efficiency. But even if the lighting cost were increased, say, ten per cent or thereabouts, it is clear from the above figures that the total production cost would be increased only a trivial amount. Another way to look at this is that the cost of providing the lighting used throughout the day equals one employe's wages for only four minutes or thereabouts. Consequently, if an improved system of lighting enables him to save four minutes of formerly wasted time, then the cost of lighting is entirely repaid by this increased efficiency of the employe.

A Few Suggestions for Improving the Lighting.

It would not be fair to point out shortcomings in present lighting conditions without also making at least a few suggestions as to how these may be improved. In this connection it should be emphasized that the extraordinary importance of adequate food supplies for the armies together with the need of preparing these in the most efficient manner requires that the meat-packing plants be operated at the highest possible production rate and standards of efficiency. It has already been shown that improvement of lighting promotes both these desirable ends and therefore is peculiarly timely. It should also be remembered that improvement in manufacturing conditions now prepares for after-war conditions when present restrictions on food consumption will greatly augment the demand for food products.

Although the amount of electrical energy needed for good artificial lighting is comparatively small, the great need for efficiency requires that wasteful lamps and equipment be discarded and that daylight conditions be improved as much as possible. This means replacing of carbon-filament lamps by Mazda (tungsten-filament) lamps, which are three times as efficient. It means discarding of arc lamps for the same reason. It also means frequent whitewashing of walls and ceilings and cleaning of windows, lamps and reflectors for efficiency as well as for the sake of cleanliness.

Furthermore, it requires the use of good reflectors to throw most of the light into useful directions instead of wasting much of it on walls and ceilings as is done when bare lamps are used. Both for efficiency and low maintenance the common tin shades should be replaced by porcelain-enameled steel reflectors or by efficient glass reflectors, if these can be hung high where they are not likely to be broken easily; the tin shades tarnish very quickly in a damp atmosphere and are at best only a cheap substitute for a good reflector with durable and easily cleaned reflecting surface.

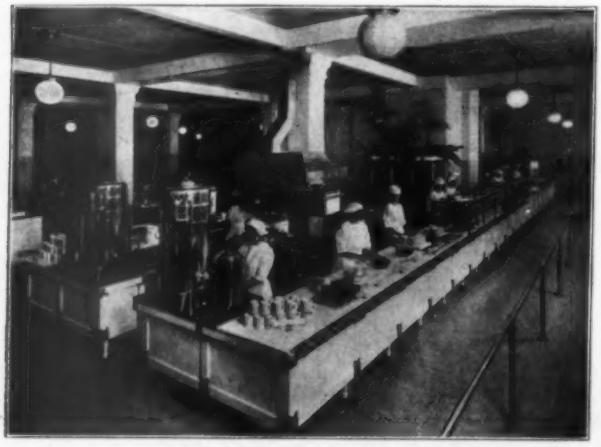


Fig. 11.—Employes' Self-Service Restaurant, Swift & Company. Daylight View. Artificial Light From Inclosed Units Gives Well Diffused Illumination.

Fig. 12.—Surgeon's Operating Room in Swift & Company's Plant. Abundant Daylight. Ceiling Cluster Units With Frosted Lamps Give Direct Artificial Light.

Abundant light should be provided for all workrooms, so that every operation can be carried out without eye-strain or visual fatigue. On account of the great variety of the work carried on in the different departments it is impracticable to give definite suggestions as to the intensity best suited. In general, however, in only a few operations, such as inspecting the dressed meat and cutting away the hide or pelt, is an intensity as high as 10 foot-candles required. Most of the operations can be carried on under an artificial illumination of 2 to 5 foot-candles, obtainable with an energy consumption of 0.4 to 0.8 watt per square foot of floor area under the best conditions with modern efficient equipment.

The light should be uniform and well distributed, avoiding the great contrasts of bright and dark areas and dense shadows, which are tiring to the eyes and may be the cause of accidents. This is best done by mounting the lamps high, as close to the ceiling as possible, and providing them with carefully chosen reflectors to secure a wide and uniform distribution of the light. This also permits using fewer and larger lamps, thereby reducing the cost of wiring in a new installation and obtaining the improved efficiency of the larger lamps. There is little need of employing a myriad of small lamps placed close together and near the table tops, as is frequently done in the canning departments, since general illumination from ceiling-mounted lamps is more efficient and satisfactory all around.

Another important thing to remember is that modern tungsten lamps are so efficient because their filaments are so intensely brilliant. This is in a sense a detriment where no effort is made to shield the eye from the direct rays of the filament, which produces the uncomfortable and blinding sensation of glare. However, this is readily taken care of by the use of good reflectors and high mounting as suggested above; the bulb projecting below the reflector should be frosted or provided with some other form of diffusing medium.

Editorial Comment

Equitable Rates Protect the Utility

IT HAS long been evident that the maintenance of full operation is becoming increasingly difficult for the non-essential industries, under the influences of intensifying control exercised over the distribution of raw materials and uniformly higher remuneration demanded by labor. However, every opportunity is being given these industries to partake, in part at least, to meeting Government needs.

Notwithstanding the lessons learned by manufacturers and producers in the way of practicing economies, learnt of necessity, the cost of production and cost of doing business continue to rise steadily and far from slowly. The cost of assembling raw materials, wages, taxes and almost every other item of expense must in the last analysis result either in an increase in selling price or reduction of profit. The only alternative to increased price for the commodity, whether street railway, telephone, light and power service, or groceries, is a periodic rearrangement of selling prices. And if this is not made, not only is service, or production, or results curtailed, but credit of the manufacturer, the utility or whoever it is that is doing business, becomes impaired. This fact cannot be better emphasized than in the case of the freight-rate increase recently put into effect. Higher freight rates, ultimately, are borne intact by the consumer, except in those instances where prices are under Government control.

The railroads furnish a glaringly illuminating example of what happens when the selling price of a commodity—in this case transportation—is kept down when it should be raised. Normal growth was impossible, improvements in track, rolling stock and policies that would have made for higher efficiency, increased economy and greater income, had to be foregone, and the railroads, if not deteriorating were not expanding and developing as they might and as the welfare of the country demanded that they should. We all know the result and we all know that rates, the selling price of transportation, have had to be raised at last, not too late, but much later than would have been best.

What applies to the railroads applies equally to the utilities furnishing light and power, communication, heat and transportation within and between cities. Most of them now are wrestling with soaring costs of doing business, furnishing service upon which the welfare of the community and the nation depends. If the status of these utilities suffer because of impaired credit, deteriorated equipment and crippled service, the fabric upon which our national progress and industrial and social life is based must suffer also. As a nation we cannot be efficient and allow our utilities to be wrecked upon the rocks of shortsighted financial stringency, or even handicapped by false economy. The fabric of our national life must continue unimpaired.

The Tractor and Conservation of Man-Power

THE hustle and noise of the city railroad terminal speaks to the layman of efficiency, prosperity and industry, because of the ceaseless motion, the noise and the vastness. But appearances are sometimes deceptive. From the road, looking down on the tracks at the Union Depot, Chicago, stood a baggage and mail train. Here some half-dozen and more men were conscientiously loading trucks with mail sacks and baggage, which men would push away toward the station some five or six hundred feet away. The load of each truck was not large, as loads go, but each truck required one man to push it. And the men pushed slowly, for the distance was long, the day hot, and it was all in a day's work. Meanwhile the unloading went along slowly, the transmission of mail was delayed, equipment was tied up and trackage unavailable for other purposes.

A little further down the same track ice was being transferred from a box car to refrigerator cars alongside. One man moved ice in the car being emptied, four men with a rope standing on the roof of the refrigerator car being filled, hauled the blocks of ice up a shoot, while a sixth man pushed each block along the refrigerator car, broke it into requisite sizes and let them fall into the refrigerator car. While this was going on the four men with the rope stood still and looked on. Every time a lump was transferred and before starting another lump on its way from the car to car the six men stopped for a chat. Not one of the blocks of ice weighed more than 100 pounds, most of them weighed far less. But each block was requiring the employment of six men, none of whom were in any way hurrying.

These are two instances, only, of the squandering of man-power, of needless labor costs, and waste of time and equipment, such as can be seen daily almost everywhere. For carting mail and baggage, whether 100 or 1000 feet a couple of electric tractors, or gasoline if the fire risk, the smell and noise, expense and trouble do not matter, would have reduced the labor and time some 40 per cent at least with all the accompanying advantages. Car unloaders for moving ice or sacks or baggage or what not here too would have cut the labor 50 or more per cent, or four men, speeding the work and hastening produce on its way. Meanwhile the railroads claim increased wages necessitated increased rates.

When it is considered that this sort of thing is going on from coast to coast, along the hundreds of miles of railroad tracks, that it goes on where every form of baggage and material is handled, and re-handled, whether on railroads, in freight shed, and factory or along the wharves, the colossal loss of effort and time and man-power is dumbfounding. Neutral as well as belligerent is husbanding its man-power for commerce if not for war. America is famed for its aggressiveness, its adaptibility, and its labor-saving schemes and processes. We have the finest and largest railroads in the world. They are now carrying the heaviest burden ever carried by any railroad. Paralysis came last winter because congestion of terminals and tracks and car shortages prevented the movement of coal. And history will be repeated again this coming winter. Meanwhile the railroads are wasting man-power inexcusably, and tieing up equipment and congesting terminals and tracks needlessly, conditions that react to affect every phase of our national life.

Why longer allow men to toil and stall at work that can be done quicker and cheaper by tractor and unloader? We sincerely implore the Railroad Administration to conserve man-power and bring up the efficiency in handling of goods to a standard at once compatible with the renown of our railroads and in keeping with the nation's needs. May the coming draft and the elimination of men from non-essential work hasten the day of the coming of the electric tractor. It has long been needed. But never was it needed more than today.

Additional Work for Station Operators

IT IS not enough to do one's bit. Each should do his best. While many men are working hard and long, others manage to drift along as in pre-bellum days. Labor is scarce, and the tendency therefore to utilize existing forces to maximum efficiency follows naturally. In casting around to find useful work for everyone, and work that keeps them busy, the central-station company naturally is tempted to utilize its operating force more intensively than heretofore.

Operating, whether power plant or substation, is work that entails being on the job with comparatively little to do ordinarily. General supervision, blowing out of switchboards, buses and air-cooled transformers, periodic tests of insulation, switching, the starting and stopping of machines, keeping the log and general maintenance, require time and constitute the major work of the operators. Stations have become more reliable because of better apparatus better installed, and improved protection. Automatic features now abound and the station operator of today has more time to spare than a few years ago. The attendant also has probably less knowledge of things electrical than a few years ago and need know less, with the tendency to employ a class of labor less skilled and trained. In some cases the use of women is even proposed.

Under these conditions the station operator's job is hardly compatible with the strenuous effort necessary to winning the war. Many there are who spend much time reading the daily papers and devouring every word of whatever literature happens to be in the station. The problem is what to give these men to do that they may alleviate the shortage of labor, at the same time spend their time more usefully in the national good, and incidentally improve themselves.

Whatever work these men be called upon to do while supervising operation, safeguarding service and protecting apparatus is the primary purpose of the operator. All other work must be subservient, and should preferably be of a mechanical nature that permits of being continued and discontinued without interfering with the work of operating.

At the annual convention of the Ohio Electric Light Association the employment of station operators for meter testing was advocated, as being one way of overcoming a serious dearth of suitable labor for this class of electrical work. While there are many things operators can do when not actually engaged in "operating," meter testing appears one of the least well adapted. The work requires knowledge and conscientious effort, it requires space and absence of vibration and external magnetic fields, a multiplicity of instruments, suitable storage, facilities for handling and transporting. The work takes time and often requires the service of two men. Moreover, it is work that not only requires skill and knowledge, but necessitates fairly steady if not actual concentrated and sustained effort. The station operator cannot always apply this and at best his attention on any one thing must be periodic, irregular and perhaps sporadic. And then there is the difficulty of harmonizing the station location with the most desirable location for meter testing properly and economically.

However, there are many things that station operators can do to good advantage, providing that the location of the substation or power house is suitable for the work. Current-consuming devices such as flatirons, toasters, fans and many more such require renewal of heating elements, new cords, and so forth. These things can be done by station operators without necessitating concentration of effort for any length of time, and can be done to advantage providing the location of the substation is suitable for economical collection and delivery of the devices to be repaired.

In some cases the location of the power plant is such that the operators can to advantage paint cross-arms, fit up insulators in their pins, prepare tie wires, and so on, work simple but useful that can be done in spare minutes with little preparation. Many an operator in railway work is ticket agent as well as operator.

Each case is different and each must be acted upon on its own conditions. However, probably most companies have operators that could do something in the time they have to spare in the way of helping out the labor shortage without adding complications to an already existing complication. It is worth the thought.

Week's Events

War Problems Discussed by Ohio Central-Station Men at Cedar Point—Power Plant Extensions in Philadelphia

WAR CONVENTION OF OHIO ELECTRIC LIGHT ASSOCIATION.

Twenty-fourth Annual Convention Held at Cedar Point, July 10 to 12.

The decision of the executive committee of the Ohio Electric Light Association to hold a convention this year was fully justified by the seriousness and importance of the meeting held last week at Cedar Point. While the attendance at previous years has been somewhat larger, the registration, 210, was greater than anticipated and the attendance at the sessions as well as the number of individual central stations represented was the greatest in the history of the Association.

The program was made up largely of reports of standing committees which have been active during the year, with a prearranged discussion of the topics. In every instance the work had a direct bearing on war conditions and the discussion dealt with the solution of the many vital problems confronting the industry today.

At the request of President O. H. Hutchings of Dayton, I. L. Oppenheimer presided at all of the sessions. The latter in opening the convention on Wednesday morning expressed the sentiment of those present when he said that the most important business before the country today is that of winning the war and in the accomplishment of this the electric utilities must play a very important part. "Central stations," he said, "fully realize their responsibilities, perhaps to a greater degree than any other industry."

Secretary D. L. Gaskill, of Greenville, in presenting his annual report, at the opening session, stated that there has been no time in the history of the Association when it was so necessary to get together and consider the various questions which are affecting the utilities in these times. His report on the financial condition of the Association showed that contrary to expectations there had been no loss in membership during the year except in associate members. Practically every central station of the state is affiliated with the organization. The finances were reported to be in excellent condition with ample funds available to continue the work of the committees.

Before proceeding with the regular business, George W. Martin, president of the National District Heating Association, was called upon. He spoke of conditions among heating utilities, which, he said, are exactly parallel with those confronting electric companies. Abnormal costs of material, fuel and labor have, however, imposed greater hardships on the heating companies because of the flat rate which is still universally in vogue.

Report of Illumination Committee.

The first report was that of the Illumination Committee, of which F. C. Caldwell was chairman. The work of this committee was curtailed by the illness of the chairman whose report comprises mainly recommendations for work to be done next year. Particular attention is directed to the Ohio Factory Lighting Code now in preparation and to the advisability of cooperating with state authorities and others in promulgating this matter.

Discussion was participated in by S. E. Doane, of Cleveland; D. L. Gaskill, Greenville; T. F. Kelly, Dayton; H. B. Dates, George Miller and G. S. Merrill, Cleveland; E. A. Bechstem, Sandusky; and F. C. Martin, Chillicothe.

Mr. Doane dealt with the subject of fuel conservation by the elimination of carbon and gem lamps. He stated that approximately 17 per cent of all fuel burned for lighting purposes is used for lighting lamps of this type, while only about 2 per cent of the fuel burned for lighting is used by electric signs. Mr. Doane felt that the Government will make every effort to discourage the use of carbon and gem lamps. However, one of the problems of the Government in its efforts to substitute more efficient for the less efficient lamps will be the difficulty of the manufacturers to meet the requirements. In this connection Mr. Doane referred to the necessity for greater adoption of standard voltages by central stations. This would greatly lessen the burdens on the manufacturers and permit of more nearly meeting the war-time demands for lamps of standard voltages. Statistics quoted showed that in 1913, only 44.6 per cent of the lamps shipped by manufacturers were of standard voltages while in 1917 the percentage was 77.6. There is still room for considerable improvement.

In connection with the more or less general tendency to curtail lighting, Mr. Doane was emphatic in his belief that it was impossible and unwise to save coal by decreasing illumination in essential places. On the contrary, there is dire need for more and better lighting in most industrial plants and offices. Lighting standards today are so low, according to Mr. Doane, that if we would increase intensities much more good would be accomplished than the coal saving involved.

G. S. Merrill, also of the National Lamp Works, presented statistics showing the saving in coal that would result by the substitution of tungsten-filament lamps for carbon and gem. Assuming three pounds of coal per kilowatt-hour, there were used about 7,000,000 tons of coal in 1916 for lighting. If only one-half the carbon and gem lamps now in service were replaced by units of higher efficiency, the annual saving would amount to 300,000 tons of coal.

Others who took part in the discussion advocated curtailing the manufacture of carbon and gem lamps if possible, or increasing the price to such an extent that their use would be greatly reduced. Mr. Doane, in replying to the query as to the attitude of the manufacturers in this connection stated that before the war Germany exported 60,000,000 lamps annually and a like number of bulbs which were used by lamp manufacturers in Great Britain, France, Italy and else-

where. American manufacturers have had to take on this burden as well as meet the increased demand at home. Bulbs are the determining factor in incandescent lamp manufacture and if the production of these can keep pace, the manufacturers can meet all reasonable demands. Mr. Doane explained that there are five sockets in use for every lamp shipped by the manufacturers and about 40 per cent of all sockets are fitted with carbon and gem lamps. Were all of these to be replaced immediately by Mazda lamps, the demand would greatly exceed the supply. The proper course is to replace the present lamps only after they have burned out and thus gradually eliminate the use of carbons and gems in those installations where they are not required. The use of smaller wattage lamps in certain instances was also advocated as a war measure.

The growing importance of industrial lighting was emphasized by others who took part in the discussion, it being the consensus of opinion that this was a field that deserved the serious consideration of central stations.

F. C. Martin discussed street lighting under war conditions, voicing the opinion that readjustment of contracts will have to be made to assure central stations of a fair return on the investment.

D. L. Gaskill called attention to a contemplated order of the Fuel Administration greatly curtailing the amount of street lighting.

Report of Station Operating Committee.

H. B. Dates, of Cleveland, chairman of the Station Operating Committee, presented his report at the Wednesday afternoon session. This committee held four conferences during the year at which papers of timely importance dealing with fuel and labor problems were presented. The report summarized the information brought out at these meetings and comprised suggestions to operating men based on these data.

W. E. East, of Toledo, opened the discussion, pointing out the importance of boiler-room instruments, especially under present conditions. The efficient power station today will have a full complement of meters, such as coal meters, water meters, steam-flow meters, CO_2 recorders, pressure gauges, recording thermometers, etc. Records obtained by the use of such instruments are of little value, however, unless followed up so as to correct deficiencies disclosed. Mr. East gave a practical demonstration of a Bailey meter and stated that these had effected coal savings of 10 per cent at Toledo.

H. W. Bromley, of Youngstown, discussed the labor situation and related the difficulties of obtaining suitable help. Central stations are in competition with steel mills and other war industries insofar as labor is concerned and wages must be made sufficiently attractive to hold employes. The Youngstown company has secured excellent results by adopting a so-called team method for handling labor. A foreman is placed in charge of a gang and made responsible for their work, all dealings being made through the foreman. Mr. Bromley favored a bonus system for plant employes.

In connection with the sudden advances made in the price of coal, W. A. Wolls, of Columbus, stated that in 1914 the cost, fired, was $1.35 per ton, while today it ranges from $6 to $7. H. L. Wallau, of Cleveland, reported that prior to 1916 coal cost $1.40 per ton delivered, while in 1917 the cost had advanced to $4.48.

Report of Meter Committee.

The report of the Meter Committee, presented by George E. Snider, chairman, was divided into three parts, dealing respectively with demand-meter performances, the problems of securing, training and keeping adequate help, and meter record systems.

The discussion related principally to the use of demand meters. George Miller, of Cleveland, said that any innovation in billing is always difficult to put into effect but under present conditions the public is more likely to accept a demand charge without complaint than ever before. He referred to the abnormal costs of all isolated-plant equipment and the ease of explaining a demand charge, especially to the customers who are familiar with these costs.

F. B. Steele, of Dayton, advocated the use of demand meters, particularly in those cases where the demand varies or increases from month to month. Where the demand becomes constant for a considerable period, it is the practice of the Dayton Power & Light Company to remove the meter. In Dayton about 60 per cent of the kilowatt output is metered on the demand basis.

Mr. Ward, of the Duquesne Light Company, Pittsburgh, Pa., briefly discussed the possibilities of employing the idle hours of station and substation attendants for meter testing.

Report of New-Business Committee.

The report of the Committee on New-Business Co-operations was divided into two parts, one under the section of commercial lighting and merchandising and one under the section of industrial power and heating. The report of the former was presented by C. E. Yacoll, of Youngstown, and the latter report was read by F. B. Steele, of Dayton. Both reports summarize the work done at the meetings held during the past fiscal year and in the case of the report of the industrial power and heating section, the papers which were delivered at the conferences are reproduced.

Dwight Miller, of New York, opened the discussion, calling attention to the possibilities of low-temperature electric heating. There are unlimited opportunities to apply electric heat but a study must be made to discover the applications. In many cases it will be necessary to change the processes in vogue before adopting electricity, as in the case of automobile enameling ovens. Mention was made of the advantages of electric heat, particularly of the absolute control that is possible.

Thomas F. Kelly, of Dayton, spoke of a campaign that will shortly be inaugurated to dispose of preferred stock to customers of the Dayton Power & Light Company. An issue of $91,000 has been set aside for this sale and it is expected to dispose of it by October 1. The salesmen of the company will handle the sale, which will be limited to 20 shares per purchaser. Mr. Kelly referred also to the continuation of house wiring in Dayton which is being solicited by the central-station salesmen but turned over for execution to a local contractor who finances all partial-payment contracts.

F. H. Hooper, George Miller, C. D. Carlson and E. A. Bechstein also discussed the report. The latter reported that since the Sandusky company had discontinued financing house-wiring contracts and also the solicitation of this business, more house-wiring business is being secured than ever before. The local contractors are now doing all the solicitation and wiring.

Work of the Bureau of Standards.

Dr. M. G. Lloyd delivered an address at the session on Thursday afternoon, outlining briefly the work of

the United States Bureau of Standards. He referred to the war work which is being done and which has necessitated additions to the laboratories. Optical glass, formerly exported from Germany, is now made at the Bureau's Pittsburgh branch according to a formula which was developed by Government engineers. The Bureau of Standards is also responsible for the successful development of range finding by sound waves, as now used on the Western front. A great deal of similar war work is under way, particularly along the lines of airplane and wireless research.

In regard to the electrical activities of the Bureau, Dr. Lloyd made mention of photometric tests, electrolysis investigations, etc. One interesting feature is a wind tunnel 6 ft. in diameter in which experiments are made on a model transmission line to determine wind-pressure effects. Air is supplied by a motor-driven blower and the velocity can be varied as desired.

The work of the Bureau in connection with the National Electrical Safety Code was discussed at considerable length. Dr. Lloyd urged that central stations study the Code and if there are rules which should be modified, action should be taken before the enforcement of the Code became mandatory.

Rate Contracts.

J. C. Martin briefly discussed the status of rate contracts in Ohio. He first called attention to a recent decision of the State Supreme Court in which the cost of acquiring business was not held to be an element of cost in rate-making. The decision further held that the Public Utilities Commission of the state had no power to fix rates established by franchise or by contract between the company and municipality. Mr. Martin believes that the indeterminate permit or legislative action could provide the only relief and he strongly urged Association action along these lines.

D. L. Gaskill contributed a brief discussion on the unessential work which utilities are required to perform, as the preparation of voluminous reports for city, county, state and Federal authorities. He said that considerable economy could be effected by the simplification of these reports and the elimination of some at least during the period of the war. Mr. Gaskill also called attention to the tax burdens placed on utilities, this industry being the only one taxed on going value, although this value is not recognized in rate-making.

Transmission and Distribution Report.

At the final session, on Friday morning, M. H. Wagner, of Dayton, presented the report of the Committee on Transmission and Distribution, of which he was chairman. This report summarizes the meetings held during the year and makes specific recommendations concerning operating practice under war conditions.

The discussion was opened by Mr. Hibben, of Cleveland, who explained various features of the practice of the Cleveland Electric Illuminating Company. He mentioned the advantages of underground systems and said that 12 wires was the maximum for leads. Underground feeders are run to load centers and all secondary distribution is overhead. In regard to subways, Mr. Hibben has found that it is not practical to install them under paved streets but rather under sidewalks, where the radiation is better. Manhole drains are not used in Cleveland but trucks equipped with motor-driven pumps are available for emergency service. Vents made of 10-inch tile are provided for manholes and where transformers are installed an 8-inch vertical air intake is provided. Standard size of manholes in Cleveland is 5 by 7 by 6 feet and four-inch ducts have been adopted as standard, this size allowing for normal growth. All high-tension cables are fireproofed by applying cheesecloth and cement covering. Mr. Hibben cautioned against installing cables in extremely cold weather before first permitting the cable to thaw.

W. P. White discussed the question of transformer standardization and Dr. Lloyd called attention to the comparatively moderate provisions of the Safety Code in regard to overhead crossings.

Alfred Alsaker, of the Delta-Star Electric Company, Chicago, drew comparisons between the tetrachloride fuse and the oil circuit-breaker, advocating the use of the former on the high-tension side and circuit-breakers on the low-tension line. He showed numerous views of outdoor substations provided with various types of protective apparatus.

Election of Officers.

The election of officers for the ensuing year resulted as follows:

President, I. L. Oppenheimer, of Pomeroy.

Vice-president, C. H. Howell, Coshocton.

Secretary-treasurer, D. L. Gaskill, Greenville.

Executive committee, O. H. Hutchings, Robert Lindsay, F. H. Golding, E. L. Franklin and W. A. Wolls.

Advisory committee, W. W. Freeman, E. P. Matthews and F. C. Martin.

Chairmen of the various other standing committees were elected as follows: Illumination, F. C. Caldwell; Meter, C. P. Garman; New Business Co-operations, Lighting Section, F. H. Hooper—Power Section, C. D. Carlson; Transmission and Distribution, R. R. Krammes; Station Operating, H. B. Dates; Standardization of Voltage, H. L. Wallan.

PHILADELPHIA ELECTRIC TO MAKE LARGE POWER PLANT EXTENSIONS.

New Plant and Addition to Chester Plant Will Furnish 120,000 Horsepower Additional to Hog Island Shipyards.

The Philadelphia Electric Company, Philadelphia, Pa., has completed arrangements with the United States Shipping Board for financing the construction of two new power-plant additions to cost about $10,000,000, recently announced. The company proposes to commence immediate work on the erection of the superstructure of the new central station at Palmer and Beach streets, foundations for which were completed last year and further operations abandoned in December owing to the local situation. It is the intention to follow out the original plans as arranged for this plant, with total estimated cost of construction of $8,000,000 and generating capacity of about 80,000 horsepower. It is expected to have the station ready for operation by the early summer of next year.

The other installation will consist of the erection of a new unit at the plant of the company at Chester, near Philadelphia, operated in the name of its subsidiary organization, the Beacon Light Company. This extension is to provide for an increased generating capacity of approximately 40,000 horsepower, and is estimated to cost $2,000,000.

With these plant extensions, the company will have an aggregate generating capacity at its different stations of about 400,000 horsepower, or an increase of

25 to 30 per cent over present output. Practically the entire increase in power will be used by the Government at the Hog Island shipbuilding works of the Emergency Fleet Corporation, which has perfected plans with the company for furnishing electric energy for operations at the new shipyards.

It is said that the establishment of new local industries during the past year resulted in an increased demand for commercial power from the company's lines of more than 35 per cent over normal requirements and which has necessitated the operation of its plants at a maximum point of output. In negotiating its loan with the Shipping Board, the company will pay interest on the sum advanced at 5 per cent, making a refund of the principal following the termination of the war.

PRESIDENT AUTHORIZED TO TAKE OVER WIRE LINES.

Threatened Strike a Factor—Prediction Made in the Senate.

The President of the United States is now armed with authority to take over and operate the telegraph and telephone lines of the country during the continuance of the war. He was empowered to take such action by resolutions of Congress adopted July 13. Those resolutions give the executive discretionary powers, authorizing such action to be taken whenever he shall deem it necessary for the national security and defense.

The principal companies whose lines will be taken over, if at any time this authority is exercised, are the Western Union Telegraph Company, Postal Telegraph and Cable Company, and the American Telephone and Telegraph Company, whose systems utilize nearly 23,000,000 miles of wires and cables.

The congressional action taken was in accordance with the wishes of the national administration, at a time when a strike of operators seemed imminent.

One of the most impressive features of the senatorial debate on these resolutions was the prediction that the railroads, now in Government control, and the wire lines, if once taken over, would never go back to private control. This prediction, we trust, will not be fulfilled. In the case of the wire lines, at least, there seems to be absolutely no need for federal operation beyond the period of the war.

COPPER MANUFACTURERS ASK WAR INDUSTRIES BOARD TO MAKE RULING.

Protest Against New Price of Copper Being Applied to Previously-Made Contracts.

There are some discordant notes among copper consumers by reason of the recent advance in the price of copper from 23½ to 26 cents by the War Industries Board. The change went into effect July 2 and the new price is announced to continue until August 15. This advance was suddenly authorized, notwithstanding the fact that copper manufacturers had been given to understand that no change from 23½ cents would be made between June 1 and August 15.

In the meantime manufacturers of copper products had accepted business on the basis of copper at 23½ cents, and in their recent protests to the War Industries Board it is contended that some of the consumers will sustain losses in carrying out their contracts if they are required to pay 26 cents a pound for copper. Evidently, purchases to supply their needs under such contracts had not been made at the time the recent advance in price was announced.

A meeting of copper-wire manufacturers was held in New York City last week to discuss this matter, and a ruling of the War Industries Board was expected soon as to the price to be paid under previously-made contracts.

With the new price of 26 cents in force the jobbers' price is automatically fixed at 27.30 cents per pound.

PROBLEM OF EMPLOYING DISABLED SOLDIERS CONSIDERED.

Some of the Disqualifications for Duties in Electrical Industry.

The employment of disabled soldiers in the electrical industry, both during the war and after its cessation, has lately been receiving the attention of employers and others concerned in the soldiers' welfare. The possibility of giving disabled soldiers such training as will make them efficient in this industry depends, of course, on the character and degree of their disablement.

Students of the problem, as it surely will present itself, foresee the necessity for the examination and classification of disabled men to determine their qualifications for the numerous classes of employment. This will require a determination of disqualifying disablements as well.

Disqualifying Disablements.

The whole subject, as it relates to the electrical industry, is analyzed in an article which appeared recently in the London *Electrical Review*. In that article the disqualifying disabilities in relation to the various departments of employment are arranged as follows:

Position.	Disqualifying disablement.
1. Switchboard attendant.	Shell shock (steady nerves required).
	Heart bad (danger of electrical shock).
2. Substation attendant.	Loss of arm (cannot work regulator handles).
3. Air compressor or hydraulic plant attendant.	Loss of leg (cannot get about quickly when there is a breakdown).
4. Battery attendant.	Loss of hearing (cannot detect things starting to go wrong by sound).
	Loss of smell (cannot smell machines or cables getting hot).
5. Engine driver.	Heart bad (hard work required).
6. Greaser.	Loss of arm (cannot work regulators, etc.).
7. Stoker.	Loss of leg (cannot get about quick enough).
8. Meter or instrument repairer.	Loss of arm (full complement of fingers required).
9. Armature and coil winder.	Loss of eye (good eyesight required, and must be able to judge distances accurately).
10. Telephone work.	Loss of arm (both hands required).
11. Bell work.	
12. Signalling devices.	Loss of hearing.
13. Meter inspector.	Loss of leg, hearing, or eye.
14. Motor inspector.	Loss of leg, hearing, smell.
15. Motor repairer.	Loss of leg or arm, hearing, smell, bad heart.
16. Installation inspector.	Loss of leg, hearing, arm.
17. Installation complaints.	Loss of leg, arm, hearing, smell, bad heart.
18. Heater and cooker inspector.	Loss of leg, arm, hearing, smell.
19. Heater and cooker repairer.	Loss of arm, hearing, smell.
20. Mains fuse inspecting.	Loss of leg, arm, smell, bad heart.
21. Mains records.	Loss of arm, eye.
22. Meter tester.	Loss of arm, eye, hearing, smell.
23. Coal, water and oil tester.	Loss of arm, hearing, smell.
24. Gateman.	Loss of hearing, arm.
25. Timekeeper.	
26. Clerical work.	

Methods of Instruction.

As to methods of instructing and training disabled men in this industry, the writer of the article continues:

"For the teaching and instructing of these men the

ordinary routine is unsuitable. The aim of the ordinary technical class is to give a boy a varied electrical education extending over three to six years, which fits him for any branch of the electrical business. A man changing his business later on in life cannot spare all this time, and cannot expect to become proficient all round. He wants help to show him what branch of the business he will stand the most chance of becoming efficient at, and then special coaching in that branch of a very practical character. Boys and men should not be taught together, as the man has forgotten much of what he learned at school, and would not care to expose his ignorance before boys. The passing of examinations, while desirable, should not be pressed, as this may frighten some away from the classes.

"The first three or six months might be spent in teaching elementary electricity and magnetism, with frequent visits to various works to enable the disabled soldier to see for himself the different branches and decide which one is the best for him. He should then receive special instruction in the branch he has chosen."

AUTOMOTIVE ELECTRIC ASSOCIATION HOLDS ANNUAL MEETING.

Standardization Chief Topic of Discussion at Largest Meeting Yet Held by Association.

The third semi-annual meeting of the Automotive Electric Association was held at Lake Placid Club, Essex county, N. Y., on July 10 to 12. The attendance was the largest of any meeting held thus far, every member company being well represented.

The association is composed of manufacturers of electrical equipment for automobiles, airplanes and motor boats.

Consideration was given to the question of extending the membership. The association approved the report of the Standardization Committee, B. M. Leece, chairman, and favorable comment was made in regard to the extent and quality of standardization work accomplished by the S. A. E. Electrical Equipment Division at the Dayton meeting.

The Legal and Patent Committee submitted a progress report. A standardized contract form was completed and recommended for use by the various member companies. In connection with the contract form, uniform service policies were also outlined.

Business sessions were completed late Friday but many of the members and their wives remained at the club over Saturday and Sunday, enjoying the mountain air and the incomparable Adirondack scenery.

ILLINOIS ASSOCIATION OF ELECTRICAL CONTRACTOR-DEALERS DOUBLES MEMBERSHIP.

District Associations Are Organized in All Parts of State.

The Illinois State Association of Electrical Contractors and Dealers, as shown by a recent bulletin issued by G. A. Engelken, executive secretary, Chicago, has doubled its membership within the last three months. District associations have been organized in nine of the ten districts of the state, and contractor-dealers in those nine districts are reported as giving loyal support to the organizations. They are beginning to realize that the future of the industry depends chiefly upon the development of the business of electrical merchandising. One of the comments of this bulletin is as follows:

"Jobbers and central stations all over the country are coming to realize that the good will of the contractor-dealers as a whole is necessary to their well being; that the industry as a whole is facing problems which can only be solved through joint action by all branches of the industry. It is a well recognized fact, however, that the electrical contractors have in the past been very deficient in developing their true functions, and before we can secure the full recognition of all our claims from the other branches of the industry it will be necessary for us to demonstrate the fact that we have developed these functions and are sufficiently organized to enter into co-operative arrangements."

NEW OFFICERS OF ILLUMINATING ENGINEERING SOCIETY.

As the result of the recent letter ballot, the following named gentlemen have been elected national officers of the Illuminating Engineering Society for the year 1918-19:

President, George A. Hoadley, of Swarthmore, Pa.

Vice-presidents, Otis L. Johnson, Chicago, Ill.; H. A. Hornor, Philadelphia, Pa.; H. K. Morrison.

General secretary, Clarence L. Law, New York, N. Y.

Treasurer, L. B. Marks, New York, N. Y.

Directors, John C. D. Clark, Boston, Mass; Evan J. Edwards, Cleveland, Ohio; James J. Kirk, Chicago, Ill.

The election of officers for the sections of the society resulted as follows:

New York Section.—Chairman, F. M. Feiker. Secretary, L. C. Porter. Managers, W. J. Clark, John P. Hanlan, L. J. Lewinson, G. W. Magalhaes, John P. Radcliffe.

New England Section.—Chairman, H. F. Wallace. Secretary, Horace W. Jordan. Managers, G. N. Chamberlin, John C. D. Clark, Raymond A. Fancy, G. A. Gallagher, Jr., A. F. Nelson.

Philadelphia Section.—Chairman, James D. Lee, Jr. Secretary, H. B. Andersen. Managers, C. E. Clewell, Washington Devereux, R. B. Duncan, W. L. Robertson, N. Wiley Thomas.

Chicago Section.—Chairman, A. O. Dicker. Secretary, Frederic A. DeLay. Managers, F. F. Fowle, James J. Kirk, A. H. Meyer, W. W. Soffe, F. A. Watkins.

PRODUCING NITROGEN FROM THE ATMOSPHERE.

The largest experimental plant in the United States for the manufacture of fixed nitrogen from the air, with the exception of the ones now being constructed for the War Department, is in operation at the United States Department of Agriculture Experiment Farm, Arlington, Va. At this plant the nitrogen from the air is combined with hydrogen to form ammonia which can be used in the manufacture of explosives and fertilizer. Experiments are now being conducted at this plant by the Bureau of Soils with a view to increase the efficiency of the process. The War Department is co-operating in this work. What is known as the Haber process of nitrogen fixation is being used. This process involves the production of ammonia from hydrogen and nitrogen. The two gases are mixed in the proper proportions, put under high pressure, subjected to intense heat and passed over spongy iron, whereupon a portion of the mixture combines to form ammonia.

Commercial

Central Stations Interested in Adequate Street-Car Fares — Lincoln Central Station's Effective Co-operation

STREET-RAILWAY RATES SHOULD BE ADEQUATE TO PRODUCE NECESSARY REVENUES.

Question of Transfers and Regulations—Councils and Commissions Tardy in Meeting Changed Conditions.

Authority to advance street-car fares has been granted in a number of cities, and many electric railway companies have applications pending before city councils and public utility commissions for the granting of similar authority. In most cases the increase, granted in some instances and asked for in others, is to establish the 6-cent fare. There are a few cases, however, wherein it is proposed to add two cents to the prevailing five-cent rate.

In connection with the plans for the proposed advance in fares is the question of transfers, on which the operating companies are not altogether in agreement as to a uniform system. But practically all of them do agree that it is desirable to get away from the over-generous system of transfers under which a passenger may ride from 15 to 30 miles for a 5-cent or a 6-cent fare, as is the case in a few large cities. On some of the lines it is assumed that with the advance in rate asked for the usual issuance of transfers may be kept in practice. Others propose a plan of collecting an additional one cent or two cents for a transfer. Few, if any, would attempt to regulate street-car traffic on the zone plan, by which people residing in the outlying sections of a city would be required to pay a comparatively excessive rate of fare to the shopping and industrial districts.

The essential matter in relation to higher fares and excess charges for transfers is that a system should be adopted that will be as free as possible from complications and annoying rules which might prove a source of dissatisfaction to passengers. Under broad, general regulations, liberally applied in practice, patrons will not be disposed to complain of higher fares, because they realize that increased costs of maintenance, labor and other operating expenses have made it necessary to produce greater revenue. The public will gradually adjust itself to the plan of purchasing coupon books containing a specified number of fares for a dollar, relieving the purchaser and conductor of making penny change when fares are paid. Then, the purchase of a coupon book should give the buyer a little economic advantage over the plan of paying the single fare in cash at the time of each ride.

The electric railways are greatly handicapped, and even crippled, by the radically increased expense of operating and maintenance, without any adequate increase in traffic, and their only relief lies in a commensurate advance in rates of service. The general public, as represented by the city councils and public utility commissions, has been slow to recognize the fact that the electric street railways will be unable to maintain their equipment and render service at a high standard if this unbalanced condition of affairs shall continue. The similar situation in other lines and industries, not under public service control, was promptly met by provision for increased revenues.

The steam railroads, after having been placed under Federal control, had passenger fares advanced 50 per cent, and freight rates 25 per cent. Those increases have been accepted by the whole country as necessary, and justifiable by reason of war conditions. Now, the telegraph and telephone lines are likely to be taken over by the Government, under an act of Congress authorizing the President to do so, and it is almost a foregone conclusion that one of the immediate results will be an increase of the wages of operators, and a corresponding advance in the cost of service to the public.

A consequence of the conditions imposed by the war is a higher level of prices in all the channels of trade and all the branches of industry and service; and the only reason street-car service does not show an advance in about the same ratio as occurred in other industries is the existence of barriers under a public control which has not proved flexible enough, nor responsive enough, to fit rapidly changing conditions.

The importance of adjusting street-car rates to a basis that will produce revenues sufficient for maintenance costs and operating expenses is beginning to be recognized; and in the name of equity and justice why should not the stockholders, whether rich or poor, receive a fair return on their investment?

This matter is closely akin to the increase of rates of central-station companies, many of which also operate street-railway lines or supply power to them In the case of such combination companies it is manifestly unfair to charge against the electric light and power business deficits in the railway departments. Each class of service must stand on its own feet and support its own burden of charges. This matter of division of costs and revenues has been passed on by many utility commissions and courts, always with the same result. Central-station companies directly or indirectly involved in railway business should therefore immediately interest themselves in seeing that the railway lines are not allowed to become a burden due to lack of revenue.

CO-OPERATION MADE EFFECTIVE IN A UTILITY ORGANIZATION.

Working Plans and Ethics of Selling Discussed by a Doherty New-Business Man.

The following extracts are from a paper prepared by James Greenstone of the new-business department of the Lincoln (Neb.) Gas & Electric Company on "Co-operation—Wherein It Will Assist in Increasing Business." It was read at a recent office meeting of that company at Lincoln:

"A business organization is not a machine made of lifeless metal and wood, but a thing that is alive, every

part having an intelligence of its own. Like a machine it may have lost-motion and friction, but it differs from a machine in that every part has a volition to do or not to do, and moods that inspire or depress. I believe that the ones who comprise an organization can get along better and work more in harmony if they understand the plan they are working under.

"From the standpoint of merchandising this company has the same amount of competition as have most of the other central stations operated by Henry L. Doherty & Company, but from the standpoint of disposing of the goods we manufacture—in this connection I mean electricity—I can say that no other Doherty company has the competition to contend with that we have. In most cases a Doherty company is the only one of its kind in its city, whereas here we contend with two others who go after the same limited number of consumers as strongly as we are doing. So you can see that our methods of getting business must be of an intensified nature or we will fall by the wayside.

"The subject of co-operation is a big one. One could offer any number of suggestions as to how the various departments could assist the new-business department in securing additional business, but they would be of no consequence unless you first understand and feel that you are an equal factor in a combined force seeking to attain a combined result.

"You should know that we can supply an appliance for either gas or electricity that could be made use of by anyone, and that the appliance obtained through us will be of the best and at a more reasonable price than could be found elsewhere, because we are a part of one of the largest concerns of this nature in the country and the largest buyers of this line of goods in this city.

"You should know that we do not recommend an appliance from the standpoint of its ability to consume an unreasonable amount of our products, but that our recommendations are based on the ability of that appliance to give satisfaction, in order that the purchaser will keep it in constant use and thereby add to output. In this lies the real profit for the company.

"You should know that we maintain service departments for the benefit of our consumers, so they may derive the maximum of satisfaction in the use of our products or the appliance they may purchase from us. And, knowing these things, you should not be backward in telling others about them. You should find any number of reasons for boosting this company. In dealing with other firms you should make it a habit to call their attention to the firm you are with and impress them with the fact that we believe in reciprocity.

"There is one point I will always contend for: Setting aside the electric end of our business in which we have competition, and that is, regardless of the fact that we are alone in the gas field, we cannot permit ourselves to feel that the public is compelled to deal with us and take what we wish to give them in the way of attention and service."

ARIZONA WATER USERS TO INSTALL ELECTRIC PUMPING PLANTS.

More than 40 electrically driven irrigation pumping plants are to be purchased and installed by the Salt River Valley Water Users' Association at an estimated cost of about $500,000. It has been found that the water level beneath the 200,000 acres that are under irrrigation from the canal that is fed by the big reservoir, created by the Roosevelt dam, has in places risen to within 9 ft. of the surface. It is for the purpose of obtaining a secondary supply of water for irrigating the land and to relieve the possibility of exhausting the supply contained in the Roosevelt dam reservoir that these pumping plants are to be installed over wells that will be fed by the seepage water from the canal. The electric power for operating the pumping plants will be obtained from the hydroelectric plant of the Salt River Valley Water Users' Association at the Roosevelt dam. The pumping cost will be nominal, it is stated.

RATE SCHEDULES BASED ON POWER-FACTOR.

Electric Machinery Company, Minneapolis, has issued its Bulletin No. 190, which is devoted to a Digest on Power-Factor. It comprises a compilation of data taken from central-station reports, the matter used having been edited by Will Brown of that company. The reports and letters referred to were received in reply to a power-factor questionnaire sent out by Mr. Brown.

The main purpose was to ascertain to what extent central-station companies base their rates to consumers upon average power-factor maintained as well as upon demand and consumption. Replies were received from 156 companies in 15 states, and those replies showed that 49 companies either have now or expect to have in the future forms of rate schedules designed to bring about high power-factor.

Many of the companies named replied definitely as to their rate schedules and these are reproduced in the bulletin referred to.

ADVERTISING BRINGS RESULTS FAR AFIELD.

The new-business department of the Denver Gas & Electric Light Company feels proud of the result of its recent newspaper campaign, advertising electrical appliances. At a recent departmental meeting it was brought out that Hoover sweepers, washing machines and dish washers, among other appliances, were being sold in various parts of the world, presumably because of the newspaper advertising campaign. Various cities in Colorado are included in this list, and also certain portions of the adjacent state of Wyoming. It was rather unusual, however, to receive an order from the Philippine Islands for a $25 sewing machine, and a request from Hong Kong to send an electric iron.

NEW BUSINESS OF LOUISVILLE COMPANY.

During the week ended July 6 the Commercial Department of the Louisville Gas & Electric Company, Louisville, Ky., accepted 57 new electric light and power customers with 31 kw. of lighting and 298 horsepower in motors. This includes contract with the Louisville Soap Company for 250 horsepower, replacing a steam plant. It is anticipated that the requirements of this plant will ultimately be two or three times the amount now contracted for. New business connected to the company's lines shows a gain of 40 customers with 15 kw. of lighting and 84 horsepower in motors. Electric energy output was 32.4 per cent greater than for the corresponding week last year.

Operating

Railroad Crossing Specification—Salt for Earths—Supply of Red Cedar—Peak Load Reduction—Street Shield

COMPARISON OF TRANSMISSION-LINE RAILROAD-CROSSING SPECIFICATIONS.

Compilation of Specifications of Eleven Railroads and Bureau of Standards.

For many years, and through the channels of the N. E. L. A. particularly, the matter of crossing railroad tracks by transmission conductors has received much attention. One of the notable facts has been the extremely severe requirements imposed by some railroads and railroad commissions upon the power and light utilities, requirements often adjudged foolishly and needlessly severe. However, less complaint has been made because of the large factors of safety involved, and the necessarily high expense required to obtain them, therefore, than that there has been so little effort made by the various railroads to get together and standardize their specifications for overhead railroad crossings.

H. M. Wagner, Dayton Power & Light Company, at the Youngstown meeting of the transmission and distribution committee of the Ohio Electric Light Association, read a paper entitled, "Overhead Crossings of Electric Light and Power Lines," in which the subject, as applying particularly to Ohio, was discussed.

The following table, contained in the appendix of the report of the transmission and distribution committee, submitted during the Ohio Electric Light Association's annual convention held at Cedar Point, July 10 to 12, was compiled by H. M. Wagner. This table shows the specifications for transmission line railroad crossings of 11 railroads, and also the recommendations of the National Electrical Safety Code, issued by the Bureau of Standards.

Examination of this table shows wide divergence amongst the specifications of the various railroads, also between them and the recommendations of the Bureau of Standards' National Electrical Safety Code.

USE OF SALT FOR GROUND CONNECTIONS.

Earth resistances or the resistance of grounds are often reduced by reducing the earth resistivity by dissolving in the moisture normally contained in the soil some substance highly conducting in its water solution. One of the most common substances for this purpose is salt, sodium chloride. Another that might be used

Overhead Crossings of Electric Light and Power Lines—Comparisons of Specifications of Various Railroad Systems

Company	Specifications	Span Length	RAIL CLEARANCE			Clear Telegraph Wires	Insulator	Method of Holding Wire to Insulator	B. & S.	Conductor Material	Conductor Clearance	Pole to Conductor	Grd. Wire Size	Structure	Cross Arm	Conductor Loading	Remarks
			Overhead	Track Main	Track Side												
Baltimore & Ohio	The American Railway Assn.	Short Adjoining Span 50% greater	30′	12	7	8′10″	Strain	Strain clamp	4	Copper strand	14000 V 20″ 33000 V 36″ 66000 V 60″	15″ 18″ 24″	4 B & S	Wood 8″ top	Grounded arm	½″ Ice 8 lb. Wind 0° F	
	Special	15000 V	olts, Un	dergr	ound	Construction Required											
Erie		Width of R. of W. plus 160′ 0″	35			15000-8′0″ 33000-9′0″ 55000-12′0′	Strain	Strain clamp	2	Copper strand	15000 20″ 33000 36″ 55000 60″	15″ 18″ 24″	2	Towers galvanized	Double steel	½″ Ice 13 lbs. Wind 0° F	
Norfolk & Western	Special	125	Main Line 50 Branch 35			5′0″	Strain	Strain clamp						Towers or poles in concrete			
Pennsylvania		250′	35			7′0″	Strain	Strain clamp	4	Copper strand			4	Towers or poles in concrete	Double steel	½″ Ice 8 lb. Wind -20° F	
N. York Central Lines Toledo & Ohio Big Four N. Y., Chicago & St. Louis Pittsburgh & Lake Erie Wabash	N. E. L. A.	Short Adjoining Span 50% greater	30	12	6	8′0″	Pin Type Strain	Special clamp Strain clamp	4	Copper strand	14000 V 24″ 33000 V 36″ 66000 V 60″	9″ 18″ 24″	4	Wood pole 7″ top min.	Double	½″ Ice 8 lb. Wind 0° F	
A. T. & T. Co.	N. E. L. A.																
National Safety Code*		No Limit given	30	12	7′0″	6′0″			4-150	Medium Hard Drawn	14000 V 15″ 33000 V 21″ 66000 V 35″	9″ 12″ 26″	4	Wood pole	Double	½″ Ice 8 lb. Wind 0° F	Sag Table. Poles replaced when reduced to ⅔ strength.

*Whenever Grounded Arms or metal arms are used insulators must be capable of withstanding 50 per cent greater voltage within 5 spans of crossing.

oftener to good advantage is calcium chloride. Both are highly soluble, both are comparatively cheap, and both are usually readily obtainable.

The use of salt serves several different but all useful purposes when used with ground or earth connections of electrical systems. According to the Bureau of Standards a more liberal use of salt than ordinarily obtains would be worth while.

The effect of salt cannot be permanent, due to percolation of moisture and amount of precipitation. In soils of loose texture, percolation of moisture from the surface downward is more rapid during rainfall and salt is carried away, therefore, at more rapid rate, and the tendency for the salt to return from a depth, to which it had percolated, under the influences of capillary action during dry weather would likewise be less in loose than in close or dense soils. In other words, salt should be renewed in loose soils oftener than in close dense soils. The quantity of salt to be used depends upon climatic conditions, conditions of the soil, and the shape, size and depth of the electrode or ground plate or pipe or device, and the extent to which the resistance of the earth is to be reduced. However, several hundreds pounds of salt could be used to advantage where an earth connection is of importance or very low resistance is imperative. For earth connections of almost any kind 100 pounds of salt would not be too large an amount.

A liberal use of salt reduces the variation in resistance with change of temperature and moisture, making for more uniform resistance therefore. Salt is probably most useful for minimizing the effect of cold weather upon soil resistance, by lowering the freezing temperature.

LARGE SUPPLY OF UNCUT RED CEDAR.

Correction by Red Cedar Association Sets Misapprehension Aright.

On page 1050, June 22 issue of the ELECTRICAL REVIEW, appeared an abstract of a paper read by L. M. Klauber before the Pacific Coast convention of the N. E. L. A. This article discussed the advantages of red cedar over fir, but pointed out why and ways in which fir might be used to replace cedar. Two statements were made, namely, "It is the opinion of many that eventually a substitute for cedar poles will have to be found," and "It is not believed Douglas fir poles will displace cedar as long as the latter are obtainable at a reasonable price."

Regarding these statements W. M. Leavitt, Western Red Cedar Association, has this to say apropos what appears to be a misapprehension as to the supplies of cedar:

"The supposition that the supply of cedar poles is limited or that the timber from which they are manufactured will be exhausted at an early date is an error. This idea has been spread over the country partly by people who are misinformed and partly by people who are selling substitutes for cedar poles.

This generation and probably several of the following generations will not have to worry over the supply of cedar poles. The supply may be limited for short periods of time due to labor shortages or a marked decrease in lumbering operations or other causes of this nature but not from the lack of timber from which to manufacture the poles.

Any shortage that exists, and during the last ten years I have not known of a single instance where requirements for western red cedar poles could not be taken care of, usually exists in one or two sizes and this shortage generally follows a period of overproduction of these sizes.

About four years ago there were so many poles 45 feet and longer in stock that the dealers thought they could never be disposed of. As a consequence of this feeling, a large number of these long poles were sold as piling and some more of them were cut back to shorter lengths.

Last year the demand for poles 45 feet and longer was good and all of the seasoned stock was used up and it was necessary to ship some green poles.

The shortage of seasoned long poles still exists but there are plenty of poles which were cut last winter and this spring to take care of the demand.

Any difficulty that has been experienced in getting western red cedar poles has probably been due to the car shortage or inability of an individual concern to furnish the sizes required.

The facts are that western red cedar poles do not grow in a solid body but are found mixed with the white pine in the Inland Empire and the Douglas fir on the coast. There is no reason to believe that the percentage of cedar poles in the uncut timber will not be as great as in the timber that is cut. In the past a large percentage of the pole timber was wasted due to the inability of the owner to market it at a profit. This condition no longer exists and the elimination of this waste and the natural increase in the lumber cut will make the supply of cedar poles sufficient to take care of a greatly increased demand.

Poles must be manufactured from the land as the logs are taken off as they cannot be conserved on cut-over land and on the other hand it is not practicable to cut poles very far ahead of the logging operations. Over a period of years the supply of poles depends upon the extent of the logging operations.

A survey of the lumber industry and the Government's reports of standing white pine and Douglas fir will convince anyone that there is no need to worry about the pole supply for years to come."

PEAK-LOAD EQUALIZATION.

Method by Which Canvass Among Consumers Enabled Voluntary Reduction of Their Peak Load.

At the present time when consideration is being given the effect of turning the clock back an hour upon the peak load, and when various modes of reducing them are under advisement, the method employed last winter by the Public Service Electric Company of Newark and presented before the N. E. L. A. convention by R. R. Young, is of especial interest.

Late in the summer of 1917 the Public Service Electric Company of Newark found it would be unable to start a 35,000-kilowatt and a 12,500-kilowatt turbine, which were under erection in two of its largest generating stations. It was decided, therefore, that beginning with November, a systematic canvass of all power customers should be made, asking the co-operation of the manufacturers using 50-horsepower and over in redistributing their load throughout the day so that heavy demands, which ordinarily might occur between the hours of 4:30 p. m. and 9 p. m. would be changed to some other hour during the 24-hour day.

Blueprints showing a typical 24-hour composite load curve of the generating stations for December, 1916, were prepared for the power representatives and agents, and a mock interview was held to illustrate the methods to be used in presenting the case to the manufacturers.

With the organization thoroughly prepared, about November 1 the visitation of power customers was begun, the campaign continuing throughout the month of November. Report forms were prepared and results of the calls upon individual customers were reported daily, these reports being tabulated by the general office. Weekly meetings of the power representatives in the state were held to discuss difficulties encountered and methods of overcoming objections.

Inasmuch as the company's rate schedule includes no off-peak provisions, the only advantage the manufacturer was to derive was the possible reduction of his average demand, thus reducing his demand charge somewhat besides, of course, giving him greater insurance against interruptions in service.

The result of this campaign in promises from customers is shown in the following table:

NORTHERN ZONE.

Division.	Total Kw. Connected Load in Power.	Promised Kw. Relief.	Promised Percentage Relief.
Essex	73,000	4,360	5.9
Hudson	40,000	5,245	13.1
Passaic	20,000	1,852	9.2
Central	41,500	3,909	9.4
Bergen	9,700	1,050	10.8
	184,200	16,416	8.9
SOUTHERN ZONE.			
Southern	23,900	2,931	12.2
Grand Total	208,100	19,347	9.3

In the following table is shown what relief was actually obtained:

ACTUAL RELIEF OBTAINED.

	Kw.	Percentage.
Northern zone	10,000	5.4
Southern zone	1,500	6.3
Grand Total	11,500	5.5

Owing to the fact that customers were probably not able to fully live up to their promises and there being some diversity in the peak loads, it was estimated that the result of off-peak canvass was the securing of approximately 10,000 kilowatts reduction in demand in the Northern zone, and 1500 kilowatts reduction in demand in the Southern zone. In fact, the maximum peak occurred in the last week in November in the Northern zone, whereas the peak of former years had been occurring in December.

Kilowatt-hours sold during November and December indicated that no curtailment of use resulted from reduction of peak. In other words, the maximum capacity required was reduced by 11,500 kilowatts without reduction in output on the part of the manufacturer.

SHIELD FROM FLYING CONCRETE AND STONE CHIPS.

The Los Angeles Gas & Electric Company is using a shield for protecting pedestrians and window glass from being struck by pieces of flying concrete, stone and asphalt which often scatter around with considerable force while pavements and roadways are being opened with picks.

The shield, as shown in the accompanying illustration, consists of a length of tarpaulin or canvas mounted upon a pipe frame of special design. The pipe frame supports are mounted upon heavy weights, that add to the stability of the shield and prevent it being overturned by gusts of wind. The pipe frame folds upon itself very compactly because of hinges made up of T-pieces and elbows. The canvas is fastened to the framework by rope, in this way preventing the chafing and rapid deterioration that would occur due to rusting and abrasion were the fastening more rigid and intimate.

Shield Used by Los Angeles Gas & Electric Company to Prevent Pieces of Concrete and Stone Flying Around When Opening City Streets and Pavements.

This shield is used by the employes working on the underground, laying conduit and gas pipes. Being light, readily folded up and erected, it is carried around readily. Merchants and pedestrians in Los Angeles have been favorably impressed with the company's policy of protecting them from possible inconvenience and danger. In using the shield the men are impressed with the wisdom of not entirely enclosing themselves with two shields, as doing so obstructs their view of traffic, which in itself creates a danger.

GERMAN 50,000-KW. TURBOGENERATOR.

The Allgemeine Elektrictats Gesellschaft has just built a three-phase turbogenerator having an output of 50,000 kw., corresponding to 75,000 h. p. and running at a speed of 1000 r. p. m. The terminal pressure of the generator is 7000 volts, and the exciter pressure 220 volts. The entire steam output is developed in a single turbine, and the entire electrical output in a single generator. The turbine weighs 250 tons and the generator 225 tons. The body of the rotor is built up from a large number of steel plates.

The shortage of raw materials apparently caused many difficulties in its production. The scarcity of nickel in Germany is emphasized in that the blading is without nickel.

WASTE-GAS ELECTRIC PLANT IN SOUTH WALES.

The Ebbw Vale Steel, Iron & Coal Company in making large extensions to its blast furnace plant, coke-ovens and by-product plant, has installed a big electric power plant which utilizes the very large volume of waste gases in producing sufficient energy to electrify the whole of the original and the extended plant at the iron and steel works as well as the collieries in Ebbw Vale and the adjoining valleys. Work is nearly completed for connecting newly acquired coal properties which are several miles distant with the central power station at Ebbw Vale.

Contracting-Construction

Croft's Concluding Article on Conduit Benders—Some Switchboard and Soldering Kinks—Contractor's Doings

BENDING RACKS AND ROLL BENDERS FOR LARGE CONDUIT AND PIPE.

Several Types of Roll Benders and Bending Machines.

BY TERRELL CROFT.

[*This is the fifth and last of a series of articles describing benders chiefly for the larger pipe and conduit sizes. They form a conclusion to the two other series of articles by the same author which appeared in the* ELECTRICAL REVIEW *as follows: "Methods of Bending Conduit," seven articles in issues of January 12 to February 23, 1918; "Some Comments on Conduit Benders," four articles in issues of April 27 to May 18, 1918. These earlier articles dealt principally with small and medium-sized conduits.*]

A Clamp-Roll Conduit Bender is illustrated in Fig. 28. This device is arranged for bolting to the top of the bench. The conduit to be bent is clamped in the

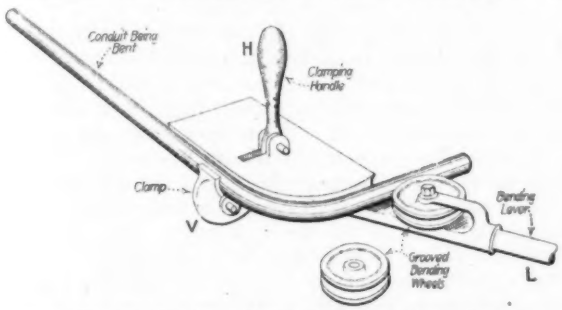


Fig. 28.—Bender Manufactured by Thomas & Betts, New York City.

lever vise *V*, which may be quickly operated by the handle *H*. Then, pulling around the bending lever *L* forms the turn.

Another Type of Improvised Roll Bender which has given satisfaction in practice is shown in Fig. 29. This differs from that of Fig. 25* in that it is arranged for mounting on a single post or column. The ¾-in.

*See ELECTRICAL REVIEW of July 13, 1918, page 66.

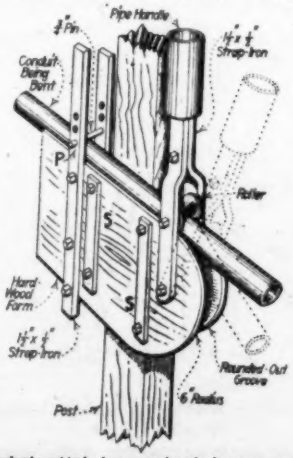


Fig. 29.—A Substantial Improvised Lever-and-Roll Bender.

pin *P*, which may be adjusted up and down in the different holes, serves the same function as does the guide board B_2 in Fig. 25. The iron straps *S* reinforce

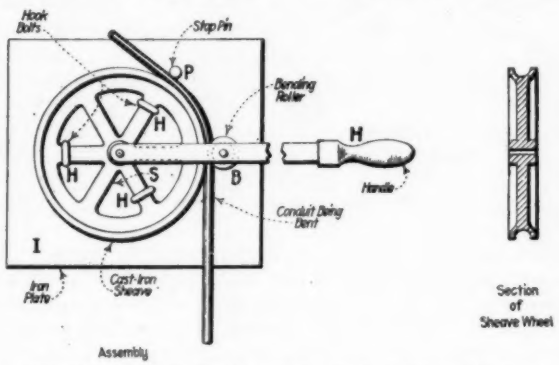


Fig. 30.—Conduit Bender Made From a Sheave Wheel.

the wooden bending form and, at the same time, the bolts which hold these straps provide a clamp whereby the entire arrangement is supported on the post. The bending lever is of strap iron, but an extension, comprising a length of wrought-iron pipe, is provided; this increases the leverage and provides a round grip for the hand. This scheme was shown by W. E. Chandler in *Power*, January 12, 1915.

A Roll Bender May Be Assembled from a Sheave Wheel (Fig. 30). The bender delineated comprises the sheave *S* (a sheave is a pulley with a groove in it for a rope), which is bolted to a plate of iron or sheet steel *I*. However, instead of being bolted to this metal plate, the sheave might have been attached to the top of a work bench. For bolts, hook bolts *H* were employed. The hook end of each of these engages one spoke of the sheave. The axle hole in the sheave was

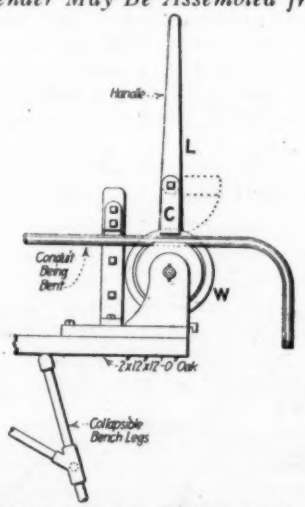


Fig. 31.—The Hercules Bender, Invented by G. E. Phillips, of Sarnia, Ontario.

bushed down to such a diameter that a ¾-inch bolt was readily admitted. Then the handle was formed from a piece of strap iron and a bending roll *B* bolted to it. The pin *P* was driven into a hole drilled in the plate. This pin constitutes a stop to hold the conduit in place.

The Hercules Roll Bender (Fig. 31) has some

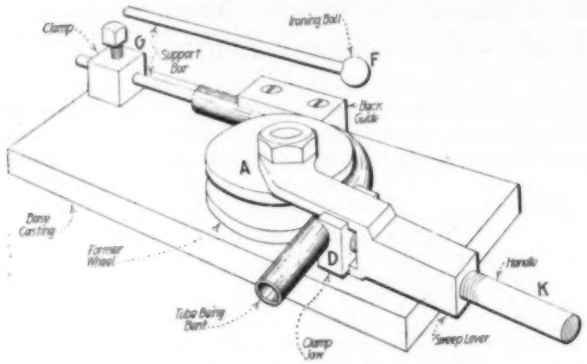


Fig. 32.—Jig for Bending Thin Tubes.

rather unusual features. The conduit to be bent is first clamped in the flat place in the wheel *W* with the clamping plate *C*. Then pulling on the lever *L* draws the tube around into the grooved form as the lever is forced downward. The pipe is inserted from the side. The tool is usually mounted on a collapsible pipe-frame bench. The bender is secured on one end of this bench and the pipe vise on the other.

A Roll Bender for Bending Tubes to a Short Radius can be built as detailed in Fig. 32. The feature of this device is the ironing ball *F*, which is inserted within the tube and there held by the clamp *G*. This ironing ball prevents kinking or buckling. In bending, the tube is first clamped into the former wheel *A* by turning the handle *K*, the end of which is threaded and which forces the clamp jaw *D* tightly against the conduit. Then as the handle is pulled around, the tube is drawn into the desired contour. For best results, the ironing ball should be of such a diameter that it fits inside the conduit quite accurately. This bender was described by F. C. Mason in *American Machinist*, December 9, 1915.

The Pedrick Bending Machines (Figs. 33 to 38) are typical of certain lines of machine benders which

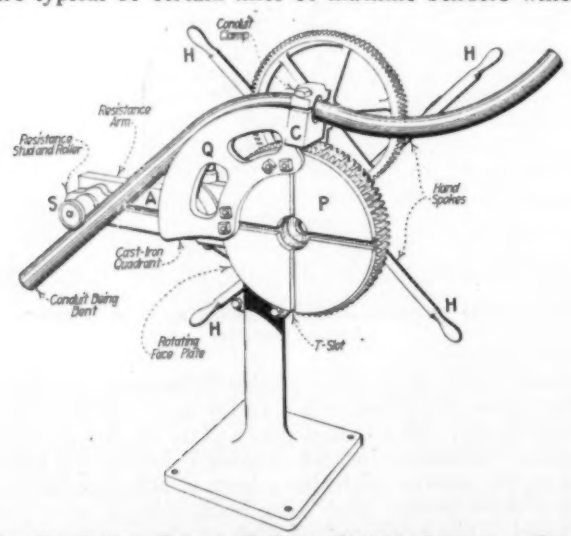


Fig. 33.—Pedrick Type A Bending Machine, Forming a Turn in 1½-Inch Pipe.

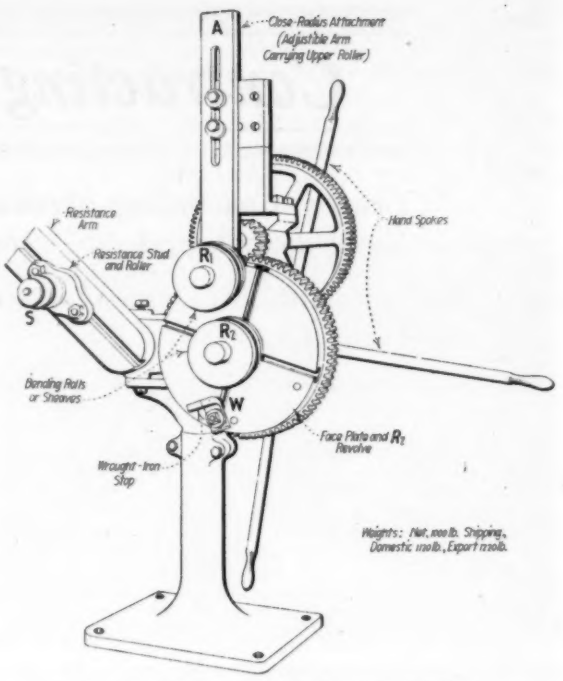


Fig. 34.—Pedrick Type B Bending Machine.

have been developed in this country. In these machines the conduit to be bent is secured in the clamp *C* (Fig. 33) at the end of the cast-iron quadrant *Q*. Then the rotating face plate is turned by a man who pulls on the hand spokes *H*. Reduction gears are inserted so that the force exerted by the man is multiplied enormously when imposed on the pipe. As the plate *P* is turned, the conduit is drawn into the groove and assumes the contour of the quadrant. The resistance stud and roller *S* restrains the free end of the tube. The type A machine of Fig. 33 is used for pipes of diameters up to 2 inches.

Bending quadrants of four different radii constitute a standard equipment which is as follows: 1-inch pipe, 6-inch radius; 1¼-inch pipe, 9-inch radius; 1½-inch pipe, 12-inch radius; 2-inch pipe, 14-inch radius. In using the machine it is desirable to locate the resistance stud *S* as far from the quadrant as is feasible because excessive stresses are thereby minimized.

Where bends of smaller radii than those just specified are necessary, the bender of Fig. 33 is modified as illustrated in Fig. 34, by the addition of an adjustable arm *A*, which carries on its lower end a roll R_1.

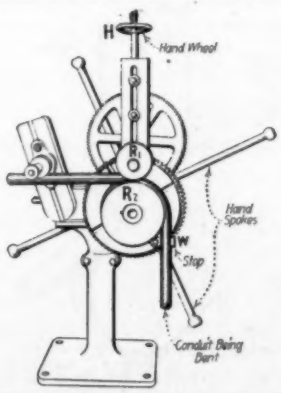


Fig. 35.—Forming a Right-Angle, 5-Inch-Radius Bend in 1½-Inch Pipe.

Note the hand wheel *H* on the top of the close-radius attachment, which is used for imposing pressure on the roll R_1.

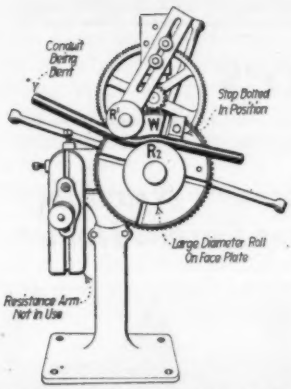


Fig. 36.—Bending an Offset With the Roll Bender.

A bending roll R_2 is substituted for the quadrant. Figs. 35, 36 and 37 illustrate how the different bending operations are performed with this device. This type B machine (Fig. 34) will bend to the following radii:

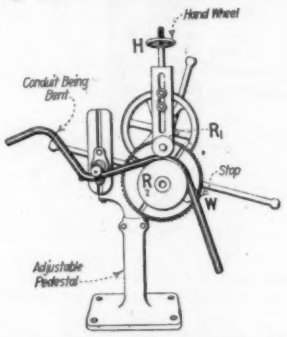


Fig. 37.—Forming a Double Right-Angle Bend on the Roll Bender. Radius of Each Bend Is 5 Inches.

1-inch conduit, 3-inch radius; 1¼-inch conduit, 4-inch radius; 1½-inch conduit, 3-inch radius; 2-inch conduit, 6-inch radius. For bending pipes up to 4½ inches in diameter, the machine illustrated in Fig. 38 has been designed. The elements of this are essentially the same as those for the bender of Fig. 33. They are, however, considerably heavier. This bender may be driven by either power or by hand, to suit conditions.

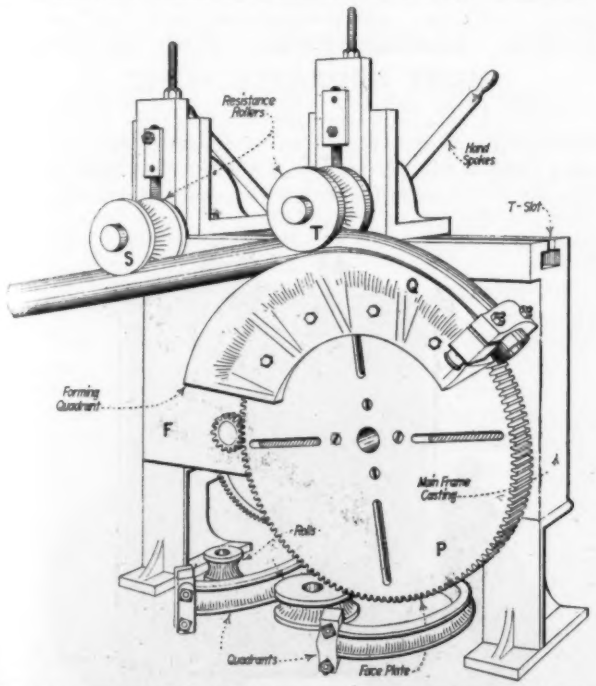


Fig. 38.—Roll Bender, Either Hand or Power-Driven, for Large Conduits Up to 4½-Inch Diameter.

REFILLING HOLES IN SLATE SWITCHBOARDS.

By A. Gemmell.

In these days of numerous changes in industrial plants, it often happens that switches, fuse holders, rheostats, etc., have to be moved to make room for some new circuits or other improvements on the switchboards. This means that the old holes must be filled up with something to give the board a neat appearance. Plaster of Paris, putty, cement, etc., are often used, but these do not look like the natural slate board. If, when drilling the new holes for the changes, the drill dust is caught on a paper and mixed thoroughly with one part plaster of Paris (which acts as a binder) to 4 parts of slate dust, and the mixture wet with a little water to the consistency of putty, and then put into the hole as soon as possible, you will find when dry that it will be almost the original color of the board. If it should look a trifle light, just put a little oil on a piece of waste and dip it into some of the drilling dust and rub over the spots.

SOLDERING STRANDED CABLE SPLICES.

By Arthur S. Nickerson.

The best and quickest method we have found for soldering splices in fairly large and large stranded wire or cable is as follows: Melt a pot of solder on a plumber's furnace or by other convenient method. Then take a small ladle and pour molten solder over the joint, catching the drippings in another ladle. Repeat until the joint is heated well, then fill up the crevices between the strands and so insure a good joint. This method has the following advantages: It may be used where there is considerable wind; it makes a better soldered and cleaner joint; where there are a number of joints to be soldered it will save 50 per cent of the time.

AMONG THE CONTRACTORS.

The J. & M. Electric Company, Utica, N. Y., has received a contract for electrical work in a new school to be erected at Whitesboro at a cost of $7,135.

R. S. Murray, Princeton, N. J., has been awarded the contract for electrical work in connection with the new school building to be erected by the Board of Education. The structure will cost in the neighborhood of $20,000.

Contract has been awarded to Louis Kalisher, Inc., 1225 Myrtle avenue, Brooklyn, N. Y., for the installation of electrical equipment in connection with the reconstruction of the large public bath house at Sea Breeze avenue, near Ocean Parkway, estimated to cost $275,000.

L. K. Comstock & Company and Freeman-Sweet Company, Chicago, have been awarded the contract for the electric wiring of the Symington Corporation's Chicago building to be erected for use in the manufacture of shells. The main building of the plant will be about 2200 feet in length and the entire works involve an expenditure of about $6,500,000. The location is at Seventy-fourth street and Ashland avenue.

New Appliances

New Service Box—Large Power Transformer—New Fiber Fuse Plug—Automobile Meters—Arc-Lamp Carbon Holder

CANTON SERVICE DISTRIBUTION BOX.

In the accompanying illustrations are shown the electric distribution box manufactured by the Canton Specialty Company, Canton, Ill. The chief purpose of this box is for use in distributing electric service wires from the pole to the customer's premises. There has been no device on the market whereby a power company could distribute its service wires in any other manner, excepting the old method of wrapping and twisting one wire around the other which, of course, makes an unsightly looking connection and is difficult to install and to maintain.

Another feature of this box is for disconnecting when meters are removed. It is the practice of most central stations to disconnect the service wires when meters are removed, if service is to be disconnected. With this box it is a simple matter to disconnect the service, leaving the meter installed, in this way saving time and money in disconnecting and renewing services

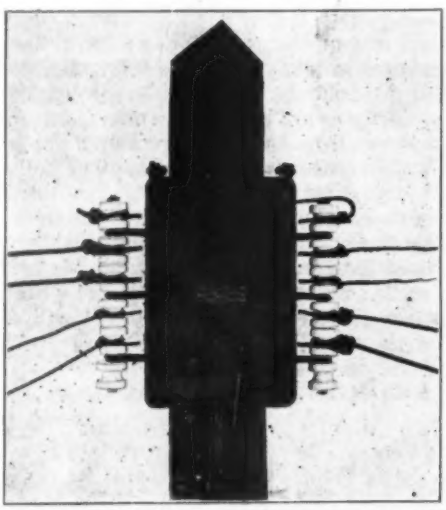


Fig. 1.—Canton Distribution Box, Closed, for Use With Overhead Connections.

in residential districts, etc. If it is necessary for a company to send a lineman up the pole to pick out the particular service wires supplying the customer to be disconnected, the cost is considerable and the inconvenience is great.

After this device is once installed on the pole, additional services may be connected with a minimum amount of labor and without soldering or taping. After four or five houses are connected to this box, all that is necessary when disconnecting is for a meter man or anyone else, if the pole is stepped, to climb the pole and with the aid of a screw driver, disconnect or reconnect the service. The Canton service distribution box is made of malleable cast iron, is very ruggedly constructed, is entirely weatherproof and should last almost indefinitely. It not only serves as a distribution box but serves as a convenient method of dead-ending services, thereby eliminating service racks, knobs and other appliances. It should enable the average central station to greatly improve its service connections and methods of metering them, and at costs below the average, and at the same time conserving labor.

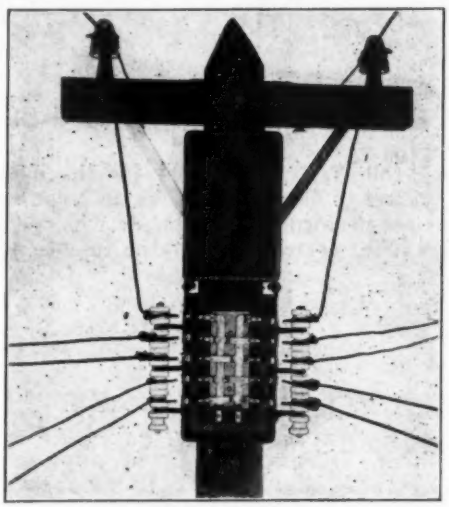


Fig. 2.—Canton Distribution Box, With Door Open, Showing Rugged Workmanship and Ample Clearances of Live Parts. For Use for Underground Connections.

LARGE TRANSFORMER FOR GOVERNMENT ORDNANCE PLANT.

When Uncle Sam went into the business of making war a little over a year ago, he found that he would have need for large quantities of electrical equipment. The electrical manufacturers were quick to co-operate

Large Power Transformer Ready for Shipment to Ordnance Plant.

with him and many of the larger firms have been working ever since on Government orders.

Among these the Packard Electric Company, Warren, Ohio, is filling large orders for automobile ignition, lighting and starting cables for Liberty trucks and large special transformers for use in the cantonments and munition factories.

The illustration herewith, taken as the apparatus was about to be loaded for shipment, shows a monster high-tension transformer built along special lines by the Packard company on a Government contract. It is one of an order of six made by the company to deliver power to one of the immense Government ordnance plants.

Other Packard transformers are now being used to furnish power and light in many of the large cantonments and training camps, both in the United States and behind the battle lines in France.

NEW FIBER FUSE PLUG.

A new type of fiber fuse plug has recently been placed on the market by the Chelten Electric Company, 4859-65 Stenton avenue, Philadelphia. The fuse plugs, which comprise a full line of all standard capacities up to and including 30 amperes, are made in

Chelten Fiber Fuse Plug.

accordance with the usual standards. This new fuse plug has been approved by the Underwriters' Laboratories. The plug is of rugged design, with generous material, as shown in the accompanying illustration, and being of fiber is practically unbreakable.

AUTOMOBILE ELECTRICAL METERS.

New models of Eveready automobile measuring instruments are now being delivered by the American Ever Ready Works, Long Island City, N. Y. This company is now concentrating its entire automobile-instrument production efforts on the dashboard instruments, styles 1012 and 1013.

In these latest models simple and strong construction has been well carried out to insure dependable accuracy. "Dead beat" movement of the pointer is obtained through the use of an aluminum vane, which moves in a partially closed air chamber and is supported on hardened steel pivots. Thus the pointer is governed by the smallest change of current flow. It is claimed that vibration of the car will not affect the reading, as the torque produced by the magnetic field is very high. Both models are dust and waterproof.

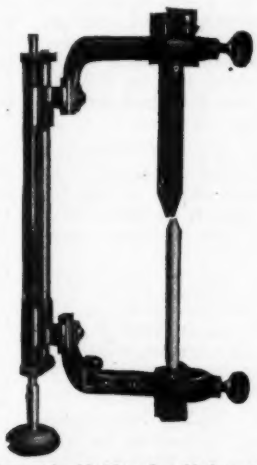
Style 1012 and 1013 Dashboard Eveready Instruments.

The regular finish of the instruments is dull black enamel with black dials, or they can be obtained in polished nickel finish with silver finish dial without extra charge. Both types have a case diameter of 2⅛ inches, and standard ranges are 15-0-15, 20-0-20 and 30-0-30.

IMPROVED ARC-LAMP CARBON HOLDER.

An important improvement is announced in arc-lamp carbon holders for Universal hand-feed arc lamps as manufactured by the Universal Electric Stage Lighting Company, 240 West 50th Street, New York City.

Heretofore the bottom holders were not made for a wide range of carbon sizes, whereas as now made for 70-ampere lamps, the holder is adjustable and will take with equal ease ¾-in. or 5/16-in. carbons or any



New Lower-Electrode Holder for Universal Arc Lamps.

intermediate sizes. The illustration distinctly shows how this is accomplished without need of explaining the mechanical details. It shows a ¾-inch carbon in the top holder and a ⅜-in. carbon in the bottom holder.

A smaller carbon holder is made for 25-ampere lamps and is adjustable in the same way to take any carbon diameter from ⅝ to 5/16-in., inclusive.

It will be noted that the carbons can be adjusted sideways as well as vertically, thus maintaining perfect alinement and constant focusing of the lens.

A special arrangement has been made for fastening lugs with asbestos wire. A carbon drop, of course, is always provided on all carbon holders.

PLIERS FOR CUTTING GERMAN WIRE ENTANGLEMENTS.

As the result of a meeting of the plier manufacturers of America in April, a simple, single-action plier was devised for cutting the German barbed-wire entanglements in the war zone. The success of this tool was gratifying because it met an urgent demand of the Government in supplying the U. S. Army with the means of destroying the German wires. Many of the shops of the manufacturers are crowded with work making these tools. Among those deeply concerned in producing these pliers was the firm of Kraeuter & Company, Newark, N. J., whose patriotic service to the country has been whole-hearted and able.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

BURLINGTON, VT.—The E. B. & A. C. Whiting Company is having plans prepared for the construction of a one-story power plant, about 50x50 feet in size, at its local brush fiber works.

LAKEVILLE, MASS.—The Lakeville State Sanitarium will build a new power plant in connection with a new laundry building to be erected at a cost of about $15,000. Curtis Bixby, 8 Beacon street, Boston, is architect.

BROOKLYN, N. Y.—Standard Oil Company, 26 Broadway, New York, has had plans prepared for the erection of a one-story pumping works, about 40x70 feet, at its local plant, to cost $10,000. It is understood that the plant will be electrically-operated.

BROOKLYN, N. Y.—P. J. O'Rourke Electrical Engineering Company, 52 Broadway, has filed notice of an increase in its capital from $25,000 to $50,000, to provide for business extensions.

BUFFALO, N. Y.—In connection with its new shipbuilding works on Abbott Road, the Ferguson Steel & Iron Company, 1499 Bailey avenue, will build a one-story power house, about 40x82 feet in size, for works operation.

BUFFALO, N. Y.—In connection with the new lamp factory to be constructed by the General Electric Company, Schenectady, for the National Lamp Works division, a one-story power house will be erected for works operation. The plant will be located on Fillmore avenue.

BUFFALO, N. Y.—Local hydroelectric and steam plants are making enlargements and extensions to provide for an increase in power for local industrial operations. In co-operation with the War Department, the Buffalo General Electric Company and the Niagara, Lockport, Ontario Power Company are now augmenting the capacity of their steam plants to provide for an increase of about 62,000 horsepower. Extensions are under way at the hydroelectric stations of the Niagara Falls Power Company, Niagara Falls, and the Hydraulic Power Company to provide for an increase of about 160,000 horsepower over present rating.

BUFFALO, N. Y.—The Capital Issues Committee, Washington, D. C., has denied the application of the city to issue bonds for $120,000 for the installation of a new flashlight signal system in the water front section.

COHOES, N. Y.—Cohoes Light & Power Corporation has made application to the Public Service Commission to take over and operate the properties of the Cohoes Company and the Cohoes Gas Light Company. In connection with the application, the company has asked for approval of a bond issue of $2,500,000 and stock issue of like amount to be used, in part, for extensions, improvements, etc.

NEW YORK, N. Y.—E. B. Latham & Company, 4 Murray street, manufacturers of electrical supplies, etc., have filed notice of an increase in their capital from $100,000 to $200,000, to provide for expansion.

NEW YORK, N. Y.—Western Union Telegraph Company has leased property at 38-40 Broad street, extending through to New street, for a period of 50 years, the site to be used for the erection of a six-story telegraph building for its exclusive occupancy. Plans for the structure are now being prepared by Marc Eidlitz & Sons, Inc., 30 East Forty-second street.

NEW YORK, N. Y.—Edison Primary Batteries Company, a New Jersey corporation, affiliated with Thomas A. Edison, Inc., has filed notice of authorization to operate in New York with a capital of $500,000. F. J. Lepreau, 30 Church street, will act as local representative.

NEW YORK, N. Y.—Public Service Commission is holding meetings on the application of the Interborough Rapid Transit Company for approval of a bond issue for $41,919,772, and $37,700,000 in notes, for extensions and betterments. The Commission is also considering petitions received regarding the current rates for electric lighting in buildings housing private electric stations.

NEW YORK, N. Y.—Marconi Wireless Telegraph Company of America, Woolworth building, has completed plans for the construction of a new wireless station to consist of three transmission towers near Buenos Aires. It is said that the plant will be the largest wireless station now in operation with a power rating of 11,000 kilowatts. Edward N. McNally is general manager.

NEW YORK, N. Y.—Arcweld Corporation, a Delaware incorporation, has filed notice of authorization to operate a works in New York for the manufacture of electric machinery and apparatus. The company is capitalized at $2,000,000. H. M. Thompson, 42 Broadway, is local representative.

ONEONTA, N. Y.—The State Board of Education will soon call for bids for the installation of new boilers and auxiliary apparatus at the State Normal School. Lewis F. Pilcher, Capitol building, Albany, is State Architect.

OSWEGO, N. Y.—Peoples Gas & Electric Company has filed application with the Public Service Commission for permission to increase its rates for electric energy at Oswego and vicinity, effective August 1, as follows: Lighting, over 1600 kilowatt hours consumption, increase of one cent per kilowatt hour; power, for motors of three horepower rating or above, new tariff of increases; lighting and power rates under an annual guarantee of $5500, one-half cent per kilowatt hour increase.

SCHENECTADY, N. Y.—American General Electric Edison Corporation of China has filed notice of an increase in its capital from $500,000 to $1,000,000 to provide for expansion.

SCHENECTADY, N. Y.—General Electric Company, River Road, has broken ground on the construction of a new two-story administration building, about 40x128 feet, to be located on Dock street. The structure is estimated to cost $16,000. Jacob Young, 711 Brandywine avenue, Schenectady, is contractor.

BLOOMFIELD, N. J. — Sprague Electric Works of the General Electric Company, Lawrence street, has commenced the erection of a new extension to its machine shop to cost about $5000. The Austin Company, 1319 Filbert street, Philadelphia, Pa., is the contractor.

BOONTON, N. J.—The Board of Aldermen is planning for the installation of new pumping machinery at the city water works. The plant was recently acquired from private interests for a municipal works and the capacity will be increased. Clyde Potts is consulting engineer for the municipality.

BRADLEY BEACH, N. J.—Residents in the vicinity of West Fletcher Lake are negotiating with the city officials for the installation of a lighting system along the lake front.

CAMDEN, N. J.—The City Council has passed an ordinance providing for a bond issue of $15,000 for the installation of a new fire alarm system.

DOVER, N. J.—New Jersey Power & Light Company, operated by W. S. Barstow & Company, New York, has completed the construction of a new transmission line extension to reach to the works of the Atlas Powder Company, Landing. The new line will carry 11,000 volts.

FREEHOLD, N. J.—The Board of Freeholders will build a large power house in connection with the proposed tuberculosis hospital at Allenwood. The plant will be equipped for lighting service as well as for steam heating.

KEASBEY, N. J.—Fire, July 6, destroyed the electric substation of the Public Service Electric Company, used for lighting and power work in this district. The company is planning for the immediate rebuilding of the plant.

MONTCLAIR, N. J.—The City Commission has approved plans for improvements, etc., in the overhead lines of the fire alarm system in the North End section. The work will be done by the Public Service Corporation.

NEWARK, N. J.—R. S. Downs Company, electrical contractors and engi-

neers, has leased a portion of the factory building at 9-13 Campbell street, for a new works.

NEWARK, N. J.—In paying the city 5 per cent as a tax on its gross receipts on city traction lines from May 1, 1917, to May 1, 1918, the Public Service Railway Company has remitted $199,380.35, the second largest amount which it has paid upon its gross receipts. In 1917, the company made a payment of $199,948.58. The gross receipts on the lines during the past year were $3,987,607.03.

NEW BRUNSWICK, N. J.—The Board of Freeholders has made application to the Capital Issues Committee for approval of a bond issue of $80,000 to provide for construction of a new electric drawbridge over the Delaware and Raritan canal.

POMPTON LAKES, N. J.—The Borough Council has approved an ordinance increasing the appropriation for the construction of an addition to the municipal lighting plant from $46,000 to $56,000. Recent bids received for the structure have been rejected and new bids will be asked.

SUMMIT, N. J.—The Commonwealth Edison Company, operating at Summit, Springfield and vicinity, has made application to the Board of Public Utility Commissioners for permission to increase its rates to large light and power consumers. The company has requested a raise of one-tenth of a cent per kilowatt-hour for each forty-cent increase in the price of coal above $3.00; the raise in price is designed to apply to all consumers paying five cents or less per kilowatt-hour. The Lakewood Coast Electric Company, Lakewood, has also made a similar application to the Board.

TRENTON, N. J.—New York Telephone Company, New York, has filed notice with the Board of Public Utility Commissioners, that a new schedule of rates has been placed into effect providing for a total reduction of approximately $800,000, as recently ordered by the Commission. Newark, Jersey City, Paterson, Passaic, New Brunswick, Plainfield, Englewood, Long Branch, and a number of other municipalities served by the company will be affected by the change.

MERCER, PA.—The Board of County Commissioners has commenced the construction of a one-story boiler plant and power house at the County Infirmary, Sharon, to cost about $25,000.

PHILADELPHIA, PA. — Hulton Printing, Processing & Dyeing Company, 3851 Frankford avenue, has filed plans for alterations in its power house at Coral and Walnut streets.

PHILADELPHIA, PA. — Effective July 10, a lightless night order has been inaugurated in accordance with the requirements of the Fuel Administration. The new regulation will affect lightless nights from Monday to Thursday of each week, inclusive.

PHILADELPHIA, PA. — Philadelphia Suburban Gas & Electric Company has filed notice of increase in rates for electric light, heat and power at Pottstown, Phoenixville and the West Chester division. The advance will affect general power rates, wholesale power, power for industrial and iron and steel works, and street railway service.

DATES AHEAD.

Association of Iron and Steel Electrical Engineers. Annual convention, Southern Hotel, Baltimore, Md., September 9-14. Secretary, John F. Kelly, McKeesport, Pa.

Northwest Electric Light and Power Association; affiliated with N. E. L. A. Annual convention, September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

International Association of Municipal Electricians. Annual convention, Atlanta, Ga., September 24-27. Secretary, Clarence R. George, Houston, Tex.

New England Section of the National Electric Light Association. Annual meeting, Hotel Kimball, Springfield, Mass., September 27 and 28. Secretary, Miss O. A. Bursiel, Boston, Mass.

American Electrochemical Society. Fall Meeting, Princeton, N. J., September 29 to October 1. Secretary, Prof. J. W. Richards, Lehigh University, Bethlehem, Pa.

American Electric Railway Association. Annual meeting, Atlantic City, N. J., October 8 and 9. Secretary, E. B. Burritt, 8 West 40th street, New York City.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kans.

PHILADELPHIA, PA.—C. H. Wheeler Manufacturing Company, Eighteenth street and Lehigh avenue, manufacturer of condensers and other power plant apparatus, has acquired property at Nineteenth street and Lehigh avenue, about 80x236 feet, to be used for the construction of an extension to its present works.

PITTSBURGH, PA.—Standard Underground Cable Company will build a one-story addition, about 60x100 feet, to cost $10,000.

SCHUYLKILL HAVEN, PA.—The municipal lighting plant is planning for an increase in lighting rates owing to the advanced cost of production. Announcement has been made that the cost of operation will be increased 30 per cent on account of the increase in the price of coal and other items.

SHARON, PA.—Savage Arms Corporation, Utica, N. Y., will build a one-story power plant addition at its local munition works to cost about $70,000. The structure will be about 40x60 feet, and will be constructed under the supervision of Westinghouse, Church, Kerr & Company, 37 Wall street, New York.

ANNAPOLIS, MD. — The United States Government, Navy Department, is said to be planning for the construction of a large electric-power plant at the local naval station, to cost about $320,000.

MONROE, GA.—Walton Cotton Mill Company has completed work on the changing of its motive power from steam to electricity.

DAYTONA, FLA.—Daytona Crate Company, a recently organized concern, contemplates the erection of a plant for manufacturing crates, including two factory buildings and a power plant. T. F. Williams is president.

WAUCHULA, FLA.—The city is planning a bond issue for $24,000 for the acquirement of the electric-light plant of the Wauchula Light & Power Company. Of this amount, $4,000 will be used for the purchase of new machinery.

NORTH CENTRAL STATES.

COLUMBUS, OHIO. — Columbus Railway, Power & Light Company has applied to the Ohio Utilities Commission for permission to sell $3,000,000 two-year 7 per cent notes at 95 or better to be used for extensions and improvements. Address secretary.

DAYTON, OHIO.—Dayton Power & Light Company will issue $56,000 preferred stock for the purpose of installing a new switchboard at the Fourth street station. Address secretary.

LORAIN, OHIO.—A communication has been presented to the council from a committee of the citizens to improve the street lighting, suggesting that the light company provide for a cheaper rate, providing a satisfactory contract can be secured. Address city clerk.

GARY, IND.—The Indiana Public Service Commission has issued an order denying the petition of Charles M. Alford to dismantle that part of the Gary Connecting Railways Company from Gary to Woodville Junction. In giving the order the Commission says that it is the duty of that body to keep open every line of transportation possible and it indicated that it believed the road could be made to earn enough to keep it in operation.

INDIANAPOLIS, IND. — Women conductors began work on 10 city car lines Monday morning, July 15. The women will be paid by the Nordyke & Marmon Manufacturing Company. The officers of the Nordyke and Marmon plant have complained of inadequate street car service to the works and made an offer to supply women conductors for extra cars to be operated from 6:15 to 8:15 a. m. and from 4:30 to 8:30 p. m. While these cars are designed primarily for the use of Nordyke and Marmon employees they will be open to the use of the general public.

RICHMOND, IND.—The City Council has voted an ordinance appropriating $55,000 for the erection of a dam across Whitewater river, adjacent to city light plant.

SOUTH BEND, IND.—Studebaker Corporation has obtained building permits calling for a minimum expenditure of $270,000. It is reported that the Studebaker Corporation, manufacturers of farm equipment and automobiles, will soon engage in the manufacture of gun shell for the United States Government.

TERRE HAUTE, IND.—E. M. Walker, general manager of the city lines of the Terre Haute, Indianapolis & Eastern Traction Company reports that 30 new pay-as-you-enter cars have been contracted for and will be in use by October 1.

DECATUR, ILL.—Bids will be called for soon for the new power house building of the Comet Automobile Company. Two boilers with 150 horsepower each will be installed at the present. The building will be made large enough for additional boilers as the business of the company expands. Steam will be used for heating.

RHINELANDER, WIS.—Rhinelander Light & Power Company is contemplating the installation of a new turbo-generator unit in its substation. E. A. Forbes, president and general manager.

STOUGHTON, WIS. — Edgerton Electric Light Company will extend its

power line to the city limits. Address secretary.

MINNEAPOLIS, MINN.—Minneapolis General Electric Company will erect a one-story reinforced concrete and steel power house to cost $485,000. Address manager of the company.

ELKHART, IOWA.—The mayor will receive proposals to build a transmission line, substation and distribution system, according to plans and specifications prepared by E. A. Larkford, engineer, of Boone. Address C. R. Boots, mayor of Elkhart.

ANDERSON, MO.—Election to vote $10,000 bonds for acquiring a water and light plant to be municipally owned for the use and benefit of inhabitants of Anderson carried. The city has an option on the Cunningham.

LATHROP, MO.—Election will be held soon to submit the proposition of the Light, Heat & Power Company, a corporation, to erect, maintain and operate a light, heat and power company plant in the city of Lathrop. T. W. Harrington, city clerk.

HOLDEN, MO. — Holden Electric Light Company is considering plans for the reconstruction of its plant recently destroyed by fire.

MARSHALL, MO.—The city has voted $80,000 bonds to construct an electric-light plant. Henrici & Lowry, Kansas City, Mo., are engineers.

CHANUTE, KANS.—Chanute is asking for a special bond election to vote $35,000 to be used in the extension of the city light plant.

DODGE CITY, KANS.—Petition for change in commercial, residence and street lighting rates will be heard before the state public utilities commission soon.

WESTMORELAND, KANS. — The town is to get its electric current by means of a transmission line to be built from the Rocky Ford plant.

PEMBINA, N. DAK.—Pembina Light & Power Company is planning to extend its lines from Bathgate to Hamilton and St. Thomas and east to Drayton. Address manager.

SOUTH CENTRAL STATES.

COLLINWOOD, TENN. — Wayne Public Service Company, recently incorporated, is planning to construct an electric light plant. The capitalization of the company is listed at $5000. John DeWitt and others are interested in the company.

SARDIS, MISS. — Panola Electric Light & Power Company will rebuild its plant reported burned.

DE WITT, ARK.—Arkansas Light & Power Company will install an electric-light system.

GREGORY, ARK. — Gregory Gin Company, recently incorporated, is planning for the installation of new power equipment for the operation of its works.

PARAGOULD, ARK.—The city council of Paragould has passed an ordinance authorizing the organization of the city into an improvement district for the purpose of erecting a municipal light and power plant.

ROGERS, ARK.—Link Pat Mining Company, Joplin, Mo., contemplates the construction of a concentrating plant and stamp mill to cost about $100,000. P. C. Quinn, 530 Main street, Joplin, Mo., is superintendent.

STUTTGART, ARK.—Arkansas Public Service Corporation, Pine Bluff, Ark., will construct an electric transmission system from Pine Bluff to Stuttgart.

CHANDLER, TEX.—E. L. Greeb is reported as contemplating the erection of an electric light and power plant.

KILGORE, TEX.—The plant of the Kilgore Electric Light & Power Company burned June 19. The loss was $4000 with $1500 insurance.

ROCKDALE, TEX.—Converting lignite coal into a fine powder and feeding the particles under boilers in much the same manner that crude oil is now handled for fuel may be put to practical and extensive use in Texas, according to plans of large industrial interests that have been conducting extensive experiments along this line for the past several months. It is stated that the process of pulverizing lignite and spraying the powder under boilers can be successfully and economically done. It is reported that the Texas Power & Light Company of Dallas has under consideration the construction of one or more large electric power plants at the lignite beds of this section of the state for the purpose of utilizing the new method of using that fuel in the generating of electric current.

WICHITA FALLS, TEX.—In connection with the proposed construction of extensive additions to the Northwest Texas Insane Asylum, a large power house for operation will be erected. The structures are estimated to cost $343,048.

WESTERN STATES.

CLIMAX, COLO.—Climax Molybdenum Company is planning for the installation of a new electric-haulage system in its new White tunnel at its properties.

MASON, NEV.—In connection with the proposed construction of a 400-ton flotation mill at the properties of the Domion Reduction Company, considerable electric equipment will be required.

BOISE, IDA.—Application has been made by J. H. Hill for a certificate of public convenience and necessity for construction of a power plant at Cascade, 75 horsepower to be generated for the purpose on the North fork of the Payette river.

CHEHALIS, WASH.—Lewis county commissioners recently granted a franchise to the Central Light & Manufacturing Company to construct and maintain a power line along the National Park Highway from Walville to Meskill, work to be started in six months. Address county commissioners.

PROSSER, WASH.—Pacific Power & Light Company has recently completed the installation of a new multiple incandescent street-lighting system, and operations have been inaugurated.

SEATTLE, WASH.—The King County Commissioners have leased to the Northwest Motor Company industrial tracts 6 and 7 on the Duwamish Waterway, upon which the company will erect an iron and steel foundry. The main building will be 90x250 feet of mill construction and will contain as equipment an electric steel furnace, iron melting cupola and overhead traveling crane. Over 100 molders and helpers will be employed.

SACRAMENTO, CAL.—Western States Gas & Electric Company has applied to the California Railroad Commission for authority to create an issue of $1,500,000 five-year 6½ per cent collateral notes, of which $690,000 are to be sold at not less than 94. Address manager.

PROPOSALS

ELECTRIC PUMPS.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 22, for furnishing and installing two surface condensers, each for a 3,750 kilovolt-ampere turbo-alternator, two motor-driven circulating pumps, one motor-driven flushing pump, auxiliary pumps for the condensers, all on foundations provided by the Government, at the navy yards, Philadelphia, Pa., and Puget Sound, Wash. Refer to Specifications No. 3085.

CAPSTANS AND TROLLEY HOISTS.—Bids will be received at Albany, N. Y., until July 23 for improving the New York state canals. The work includes terminal contract No. 109, for furnishing, testing and delivering electric capstans and trolley hoists at Pier 6, East river and West Fifty-third street pier, New York City, and electric capstans at the Utica Terminal Lock. Address W. W. Wotherspoon, Superintendent of Public Works, Albany, N. Y.

ELECTRICAL SUPPLIES.—Sealed bids will be received July 24 for the following supplies: Street lamps, fuses, batteries, outlet boxes, condulets, reflectors, sockets, switches, fans, copper wire, wire-rope cable and clips and other material, at the office of the General Purchasing Office, Panama Canal, Washington, D. C., for furnishing the above mentioned articles. Blanks and information relating to this circular (1222) may be obtained from this office or the office of the United States Engineer offices in the principal cities of the United States. Address A. L. Flint, General Purchasing Office, Washington, D. C.

ELECTRIC PASSENGER ELEVATORS AND COIN LIFTS.—Bids will be opened at 3 p. m., July 30, for the installation complete of one electric passenger elevator and two electric coin lifts in the United States Assay Office building, New York City, in accordance with the drawings, specifications, and addendum to the specifications, copies of which may be had at the Supervising Architect's Office, Treasury Department, Washington, D. C., at the discretion of James A. Wetmore, Acting Supervisng Architect.

ELECTRIC LIGHTING EQUIPMENT.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 29, for furnishing and installing high-tension switchboard of one panel, primary and secondary wiring, cables, conduits, transformers, panel boards, supports, receptacles, fixtures, lamps, reflectors, and accessories for complete lighting and power systems for the shipbuilding Slip No. 2 at the Navy Yard, New York City.

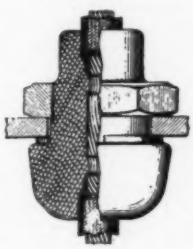
Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Insulating Material (1,267,696).—Walter E. W. Richards, of High Holborn, London, England, makes insulating materials by impregnating articles of cement with a soluble pitch-like residuum, consisting of products obtained by distillation from the lighter fraction of tar.

Filled Cable and Fluid Stop (1,267,832).—Solidifiable material is supplied to a portion of a cable in fluid



No. 1,267,832.—Fluid Stop for Filled Stranded Cable.

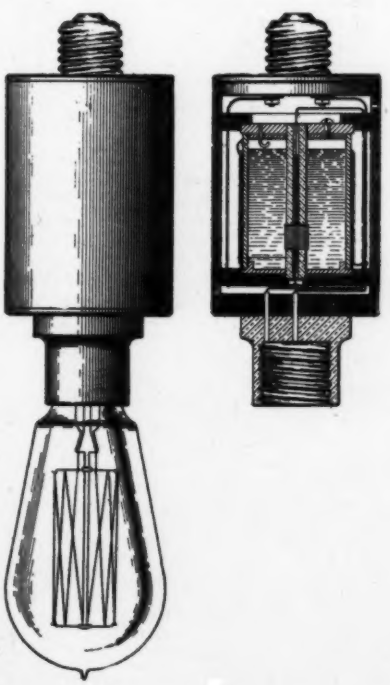
form while the strands of the cable are locally pressed close together, and the pressure is removed after the inserted material has solidified. The patent was assigned by James Wilkinson, of Pittsburgh, Mass., to the General Electric Co.

Electric Welding (1,267,400). — A thin layer of fusible metal is placed between the welding electrode and the surface of the work engaged by the electrode, according to this patent, assigned by James H. Gravell, of Brooklyn, to the Thomson Spot Welder Co., of Boston.

Resistance Body (1,267,641). — A stack of resistance elements consists of elements of silit, each coated with a layer of carbon, silit being chosen as a non-porous electrically conductive material whose conductivity is lessened under the influence of electric arcs. The patent was assigned by Georg Egly or Gebrueder Siemens & Co., of Berlin-Lichtenberg, Germany, and therefore belongs to the class of patents under which American manufacturers can be licensed by the Federal Trade Commission.

Heat-Balance Duplex Drive (1,267,386).—Under this title Dion K. Dean, of Winthrop, Mass., has patented a driving arrangement for a pump or other machine, in which an electric motor and a steam turbine are arranged to drive the machine either singly or together, and in which either drives the rotor of the other when the latter is idle. The patent, which was assigned to the Alberger Pump & Condenser Co., of New York, also relates to steam-pressure relief valves controlled by a speed governor when the driven machine is running at a predetermined speed.

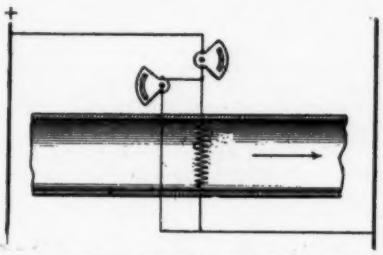
Metering Electricity at the Lamp (1,264,982).—As a substitute for the common methods of metering and of afterwards collecting for the metered energy, Edmund O. Schweitzer, of the Commonwealth Edison Co., Chicago, has patented a socket attachment designed



No. 1,264,982.—Electrolytic Lamp Meter.

to become inoperative when a predetermined amount of energy has passed through it. For this purpose, he provides an electrolytic cell in shunt with the lamp and including an anode of such size as to be entirely consumed in a given number of hours, thus rupturing the circuit and compelling the user to buy another such metering device.

Gas Meter (1,265,775).—An exceedingly simple electrical device for measuring the flow of gas is shown in this patent, issued to William S. Hadaway, Jr., of New Rochelle, N. Y., on an application filed in 1912. A single resistance placed within the gas main forms a heating element, and the heat from it is dissipated in proportion to the cooling effect of the gas, or rate of flow of the latter. By reading an ammeter in series with the resistance, and a voltmeter shunting the resist-



No. 1,265,775.—Electric Gas-Flow Meter.

ance, the ohmic resistance can easily be calculated and calibration curves can be provided to show the corresponding rate of flow.

Switch-Containing Plug Connector (1,266,801).—As a convenient means for controlling the current for electric flatirons or the like, George H. Hart, of West Hartford, Conn., mounts a switch right in the plug connector, using a snap-acting switch operated by a slidable cross-bar.

Electric Welding Apparatus (1,267,480).—The welding transformer designed by Edmund J. von Henke, of Lynn, Mass., has pole pieces which magnetically attach themselves to the work, thereby holding the appliance in its working position. The patent was assigned to the Thomson Spot Welder Co., of Boston.

Insulating Material (1,267,883).—Parchmentized fiber is impregnated uniformly with oil, treated to render it flexible, shaped to a definite form, and then subjected to an oxidizing treatment to harden it and to solidify the oil. The patent was assigned by James McIntosh, of Morristown, Pa., to the Diamond State Fibre Co.

Thermostatic Valve (1,265,765).—In the valve patented by Harry A. Ferris, of Cheyenne, Wyo., a volatile liquid is placed in a cup exposed to the fluid, which is controlled by the valve, and the cup has corrugated sides so as to be readily compressed or elongated according to the changes in pressure of the liquid in it. The free end of the cup or container carries both the valve stem and a contact closing a circuit through an electric heater.

Trade Activities

Kilbourne & Clark to Erect New Plant—Luminous Unit Co. Appoints Chicago Representative—Special Catalogs

Electrical Engineers Equipment Company, Chicago, announces the appointment of Rutherfoord & Uptegraff as its exclusive representative in Pittsburgh and surrounding territory, with headquarters in the First National Bank building, Pittsburgh.

Crouse-Hinds Employees Active in War Garden Work.—Almost 150 war gardens are now being worked by employees of the Crouse-Hinds Company, Syracuse, N. Y., manufacturer of Condulets and other electrical specialties. The grounds, which were provided by the company, are located on Wolf street, convenient to the factory, and are used for the production of practically all common vegetables. The grounds are crowded with workers every evening and Saturday afternoons.

The Ohio Electric Controller Company, Cleveland, Ohio, has issued Bulletin No. 101 for July, illustrating and describing its mill type lifting magnet. In the magnet construction the studs are made of chrome-vanadium steel, and the nuts are protected by ribs of cast steel. It requires little headroom, affords ample heat radiation, and all coil insulations are of asbestos, and are waterproofed. A useful table is given, showing the various sizes of these magnets, their headroom, average current, lifting capacities and the kind of material they are adapted to handling, such as plates, slabs, castings, car wheels, pig iron, and material in connection with furnace work. These lifting magnets are supplied with direct-current energy, usually at 220 volts. If alternating current only is available, a motor-generator is used to produce the 220-volt, direct current required.

Kilbourne & Clark Manufacturing Company, Seattle, Wash., extensive manufacturers of wireless apparatus under patents of Lieut. Com. Frederick G. Simpson, U. S. N. R. F., vice-president, general manager and chief engineer of the concern, has disposed of its building and site where the plant is now operating on Connecticut street, to the Skinner & Eddy Corporation, a shipbuilding concern, and has purchased a three-and-one-half-acre site at the northwest corner of Whatcom avenue and Spokane street, where it will erect a plant to cost about $250,000. Four buildings are to be erected at once, including a machine shop 300 feet long by 100 feet wide. A two-story concrete office building is to be erected, also concrete testing laboratory and warehouse. All of the buildings will have concrete floors and all except the office building will be one-story with glass sides and saw-tooth roofs. During the year ended June 30 the company manufactured wireless sets for over 400 ocean-going ships.

Harvey Hubbell, Inc., of Bridgeport, Conn., under the date of July 10, issued a trade discount sheet applying to Hubbell material, covering reflectors, shade holders, lamp guards, pull switches and similar supplies, with other price information for dealers.

Luminous Unit Company and St. Louis Brass Manufacturing Company, manufacturers of Brascolites and general lighting fixtures, announce the appointment of Alfred O. Dicker, formerly of Electrical Sales Engineers, Inc., as their Chicago representative. The new branch office of the companies will be located at Room 1109, 108 South La Salle street, Chicago.

Burton R. Stare Company, Northwest representative of the Sangamo Electric Company, Springfield, Illinois; Packard Electric Company, Warren, Ohio; Line Material Company, South Milwaukee, and other companies, is now located at 325 Yesler Way, Seattle, having moved from 102 Prefontains Place. The company reports much activity. Among the orders recently received was one for a Westinghouse 1,000-kilowatt motor-generator set for the city of Seattle, same to be used in connection with the operation of the municipal railway. The price paid was $24,780 f. o. b. factory.

Cutler - Hammer Manufacturing Company, Milwaukee and New York, has just published a four-page pamphlet, covering equipment for mines with particular reference to the C-H line of equipment. The line illustrated and described consists of sectional charging equipment of miners' lamp batteries. A miner is shown placing a battery to be charged in one of the racks at St. Michaels, Pa., mine, where the equipment consists of 25 unit racks and 5 rheostat panels, with space for 250 lamp batteries at one time. Each unit rack will accommodate any number of lamp batteries up to 10. As many of these units may be installed together as may be required. Space is also devoted to illustrating and describing charging equipment and control apparatus for mine locomotives. This charging equipment is similar to that used for charging industrial trucks and street vehicles, being made up of the standard C-H Universal section. From one to six universal sections may be mounted in a panel and two or more panels bolted together for large installations. A mine installation of automatic motor-driven pump control is also shown and the large saving effected by this electric apparatus over the previous steam pumps is given. Reference is made to the complete line of C-H starters, rheostats and controllers for general mine motor applications.

Essington Works of Westinghouse Electric & Manufacturing Company.

To facilitate the manufacture of electrical apparatus and steam turbine generator units and their accessories, the Westinghouse Machine Company a short time ago consolidated with the Westinghouse Electric & Manufacturing Company, and is now known as the Machine Works of the Electric Company. As manufacturing facilities at East Pittsburgh, the location of both plants, had about reached their limit and further increases there were deemed inadvisable, on account of the lack of available land, and because over 25,000 people were already employed in these works, a new site was selected, capable of expansion to a size comparable with East Pittsburgh.

Essington, or South Philadelphia, was finally selected as having a bountiful supply of good water necessary for building and testing of marine apparatus, abundance of ground for present manufacturing purposes, future expansion and the housing of employes. This property embraces 500 acres, with a frontage of 4,500 feet along the Delaware River, lies nine miles south of Philadelphia and can be reached by the Pennsylvania, the Philadelphia & Reading railroads, or the Philadelphia Rapid Transit Company. The Delaware River affords a means of transportation, but as yet no docks have been built.

The plant now is devoted entirely to production of ship propulsion machinery for the Submarine Boat Corporation and the Merchant Ship Building Corporation as agents for the Emergency Fleet Corporation, and also for the United States Navy.

So far seven buildings, including the pattern storage shop, foundry, forge shop, power houses, two machine shops, and an erecting shop have been erected. Ample provisions have been made for the welfare, comfort and safety of the employes.

Desiring to make use of central-station power, at the same time securing steam for heating the buildings economically, an arrangement has been effected with the Philadelphia Electric Company, which distributes current in this territory, that promises to work out unusually well for both companies. Steam heat required in the winter months, is not needed in the summer months, and steam is then required only for testing purposes. The Westinghouse Company has arranged to operate its own plant non-condensing during the winter, utilizing the exhaust steam for heating. When heat is not needed, current for the operation of the works is secured from the Philadelphia Electric Company. In this way the com-

pany's coal bill may be reduced, the Philadelphia Electric Company's summer load and income improved.

Three-phase, 60-cycle current is delivered at 66,000 volts to an outdoor substation, there stepped down to 6600 volts, and distributed at this pressure over the works and the power house through lead-covered underground cables.

The power house contains at present three three-phase, 6600-volt, 60 cycle, 1500-kilovolt-ampere steam turbines, which, as above stated, operate non-condensing. Steam is supplied from six 625-horsepower Stirling boilers using Westinghouse automatic underfeed stokers. A switchboard of 21 panels with the necessary measuring and switching devices, controls the ouput of the plant. Space is provided for the additional installation of three 3000-kilovolt-ampere units. Generator excitation is supplied from both motor and steam-driven exciters, while direct current for the operation of the switchboard and the high-tension switch in the outdoor substation is furnished by a 60-cell, 80 ampere-hour storage battery.

Distribution to the various buildings is accomplished by means of substations, four of which have been installed, at which the voltage is stepped down from 6600 to 440 volts for all constant-speed motor applications such as elevators, air compressors and machine tools. For operating blowers, furnaces, cranes and other variable-speed applications 250-volt direct current is obtained from rotary converters installed in the substations. Rotary converters are operated at unity, and the synchronous motors used for driving the air compressors in the substations, are slightly over size, the excess in capacity being used as a corrective measure to improve power-factor.

From the substations, current is carried to the various buildings through underground cables to switchboards, from which it is distributed to the motors.

The lighting system is supplied through separate transformers installed in each substation, to reduce the pressure to 440 volts, the distribution pressure throughout the buildings. This potential is reduced by transformers installed on the outside of the buildings to that of the lamps, 110 volts.

Ample supply of water for manufacturing purposes is obtained from a seven-foot canal from the Delaware River, with a surface at high tide of 45 feet. A concrete settling basin serves to remove the mud and silt. The canal ends in a concrete receptacle on the testing floor of the erecting shop where a large amount of water is required for the testing operations. This box also serves as the distributing center for the other buildings.

Waste water is emptied into a similar receptacle located above the one mentioned, from which it is discharged to a 78-inch concrete pipe connected with the discharge canal, which also acts as a storm sewer for the plant. Fire protection is obtained from the reinforced intake flume, water being pumped to a tank from which it flows by gravity.

An elaborate plant on the Imhoff system with lime as a precipitant, with sludge basins used to dry the effluent from the tanks takes care of the sewage. Water for drinking and cooking purposes is obtained from the city of Philadelphia Water Works.

All of the buildings, except the pattern storage shop, are of heavy steel construction, walls of tile, the sash of steel, and saw-tooth type roofs, consisting of concrete slabs covered with asphalt asbestos waterproofing material. The pattern storage shop, at the present time housing the offices, is of reinforced concrete, of a flat slab mushroom type construction, with intermediate panels between the concrete posts of tile.

All buildings are well lighted and equipped with the most modern tools and facilities for the comfort and convenience of the workmen. Toilet rooms are separate from wash rooms, and both are plentifully distributed throughout the works.

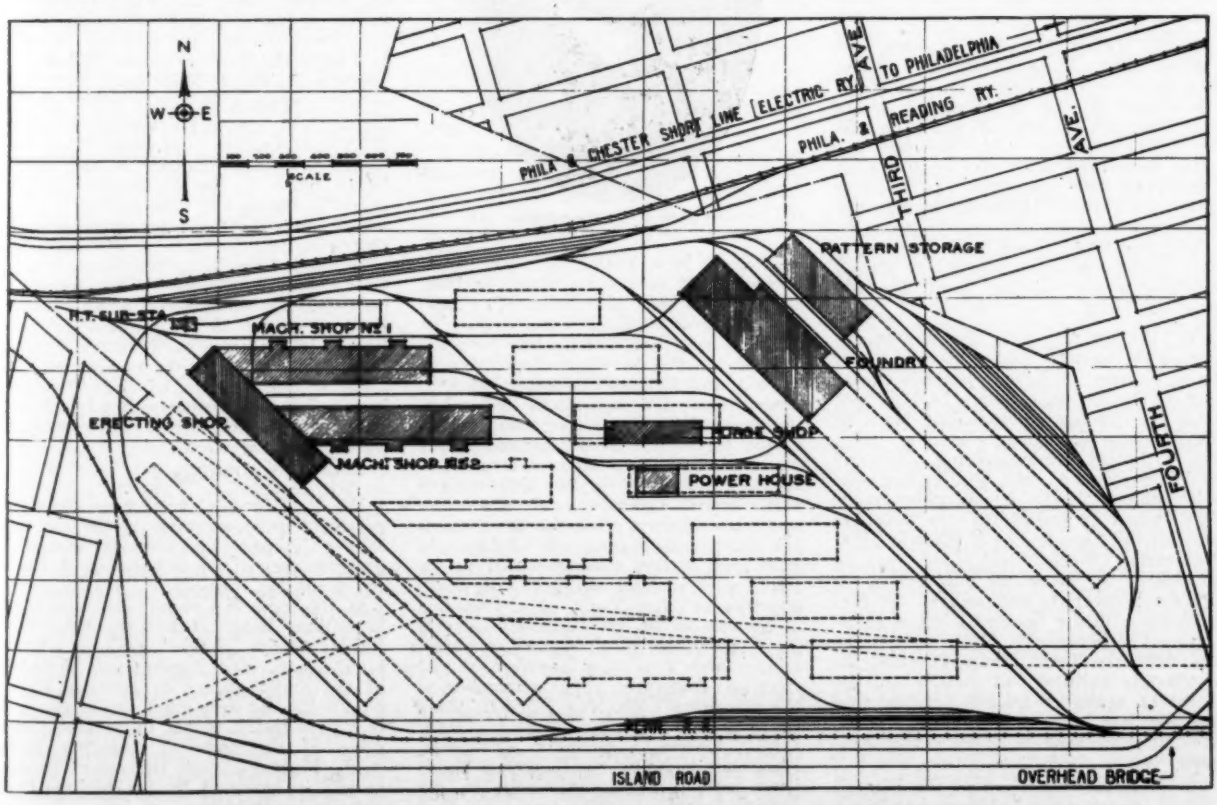
Transportation between the buildings and the yards is effected by storage battery trucks, some of which are equipped with Edison batteries and some with lead batteries.

Standard gauge tracks are laid throughout, for use by railway and works equipment alike, thus obviating the disadvantage of maintaining tracks and equipment of different gauges.

Every machine in the shops is equipped with the latest and most approved safety devices and all are electric motor driven.

H. T. Herr, vice-president, was entrusted with the selection of the site and general direction of the construction and operation of the plant. R. B. Mildon, assistant to vice-president, has been in direct charge of the construction work.

All business relations with the Westinghouse Church Kerr & Company, the builders, have been handled by Calvert Townley, assistant to President E. M. Herr, who had final approval of all arrangements.



Plan of Essington Works, Westinghouse Electric & Manufacturing Company.

Personal

F. E. Donohoe Promoted—F. A. Mansfield Joins Mechanical Appliances Co.—H. S. Johnson Resigns—Other Changes

ROYCE L. BEERS has severed his connection with the U. S. Radiator Corporation, Detroit, Mich., to enter the engineering department of the Bailey Meter Company, Boston, Mass.

C. B. WILCOX, chairman of the Board of Directors of the Sandusky Gas & Electric Company, Sandusky, Ohio, has been elected one of the trustees of the Sandusky Chamber of Commerce.

A. B. VANDERCOOK, for the past six months specialist at the Los Angeles branch of the Western Electric Company, has been appointed sales manager at Los Angeles.

M. K. FOXWORTHY, manager of the Danville Light, Heat & Power Company, Danville, Ill., has been appointed general superintendent of the Merchants Light & Heat Company, Indianapolis, which recently purchased the property of the Danville company.

H. S. JOHNSON, western district representative for the automobile equipment department of the Westinghouse Electric & Manufacturing Company, with headquarters at Indianapolis, Ind., has resigned to become associated with the Ansted interests, manufacturers of the Lexington car and the Teeter motor. He will be located at the plant of the Teeter-Hartley Motor Company, Hagerstown, Md.

L. R. BROWNE, credit manager and cashier of the Philadelphia office of the Western Electric Company, has been transferred to the International Western Electric Company, of which he will be credit manager. Mr. Browne became connected with the company in December, 1906, beginning as a claim clerk in Chicago. In the following year he was sent to Omaha, but returned to Chicago in 1908. Later in the same year Mr. Browne was transferred to Philadelphia, where he has been for the past ten years.

W. E. QUILLIN, new business manager of the Lorain County Electric Company, Lorain, Ohio, has become manager of the Salina (Kans.) Light, Power & Gas Company, succeeding Matt. L. Derge, who has resigned to go with the Trumbull Manufacturing Company at Warren, Ohio. Mr. Quillin has been with the Doherty organization since 1907, when he joined the new business staff of the Lincoln Gas & Electric Light Company, Lincoln, Neb. He was a graduate in electrical engineering at Purdue University and secured his first position with the General Electric Company at Schenectady, N. Y. Later he was with the Terre Haute, Indianapolis & Eastern railway and then joined the Doherty ranks at Lincoln. Since that time he has been at Montgomery, Ala., Easton, Pa., New York City, and Alliance.

P. F. APFEL, president of the Electric Sales Corporation, Henry building, Seattle, is making a trip to Toronto, Canada for the purpose of establishing a Canadian factory for Apfel's system of electric heating. The company recently sent sixteen electric heating radiators to Anyox, B. C., for the Granby Mining & Smelting Company.

W. B. MONTGOMERY has resigned his position as manager of the water and light departments of Kaukauna, Wis., to take charge of engineering and new business of the Wisconsin Traction, Light, Heat & Power Company, Appleton, Wis.

FRANCIS E. DONOHOE, local sales agent of the National Conduit & Cable Company, was recently promoted to the position of general sales manager of that company and the National Brass & Copper Tube Company, with headquarters in New York City. Mr. Donohoe was born in Lowell, Mass., in 1864, and was educated in the schools of Boston. In 1882 he entered the employ of the American Bell Telephone Company, and later under the direction of Messrs. Edison and Gilliland, experimented in long distance telephony until 1887, when he was appointed fleet secretary, allied to the Pay Corps of the United States Navy. In 1890 he resigned to engage in special cable work for the Edison General Electric Company. Mr. Donohoe opened a western office for the American Electrical Works, of Chicago, in 1894, and in 1906 was promoted to the position of eastern manager with headquarters in New York. Mr. Donohoe is the son of the late Brigadier General M. T. Donohoe, U. S. A., and is widely known and a popular member of the electrical fraternity. He is a member of the Engineers Club, New York Railroad Club, Machinery Club, Military Order Loyal Legion, Telephone Pioneers, American Institute of Electrical Engineers and other organizations in the United States.

Francis E. Donohoe.

GEORGE P. SONN has resigned as engineer of the Bridgeport Brass Company, Bridgeport, Conn., to accept a similar position with the National Conduit & Cable Company, Hastings, N. Y.

ELMER DOVER, vice president of H. M. Byllesby & Company, in charge of Pacific Coast properties, has been elected president of the Tacoma (Wash.) Council of Boy Scouts.

ALBERT E. CASE, credit manager and cashier of the Boston house of the Western Electric Company, has been appointed credit manager and cashier of the Philadelphia office of the company.

JOHN C. GEST has resigned his position with the Pacific Power & Light Company at Sunnyside, Wash., to work for the United States Reclamation Service as chief operator in the Government power plant near Grandview.

FREDERICK J. MACLEOD, Cambridge, Mass., has been appointed a member of the reorganized Public Service Commission of Massachusetts by Governor McCall. Joseph B. Eastman, Cambridge, and Everett E. Stone, Springfield, were also appointed members.

P. O. POSSON, for the past 11 years superintendent of the city water and light plant at Algoma, Wis., recently resigned that position to become manager of the water and electric departments of the city of Kaukauna, Wis. Mr. Posson began his electrical career in 1901 with the Sheboygan Railway & Electric Company, Sheboygan, Wis.

F. A. MANSFIELD, after 12 years of service with the Westinghouse Electric & Manufacturing Company, has resigned to become manager of the Pittsburgh office of the Mechanical Appliance Company, of Milwaukee, Wis., which company has recently opened offices in Detroit, Chicago, Minneapolis, Cincinnati, Cleveland, Washington, and now enters Pittsburgh. This company manufactures motors and generators of limited sizes. Mr. Mansfield is well known in the electrical industry, having been connected with the export and industrial departments of the Westinghouse Company for many years. Prior to his resignation he had been employed on Government work.

Obituary.

W. P. PARSONS, until recently vice-president and secretary of the Cohoes Power Company, and secretary and general manager of the Cohoes Gas & Electric Company, Cohoes, N. Y., died July 7 at his home in Cohoes. He had been in failing health for some time and retired from active business three months ago. Mr. Parsons was 60 years of age and a native of Hoosick Falls, N. Y. He had been employed in gas and electric lighting plants in several large cities of the country, including New York, Pittsburgh and Denver. The deceased is survived by his widow, two sons and a daughter.

Men in Service

P. B. Findley Enters Training School of Signal Corps—W. L. Edison Enlists in Army Tank Division—Honor Rolls

FRANK R. FIELDING, of the Philadelphia office of the Western Electric Company and who enlisted about ten months ago as a sailor, has received a commission as ensign.

WILLIAM S. JAMES, until recently connected with the Rochester Electrical Supply Company, Buffalo, N. Y., is now serving on the Electrical Division, War Industries Board, Washington, D. C.

BELL TELEPHONE COMPANY of Pennsylvania in the July number of Telephone News publishes a supplementary roll of honor, containing the names of 91 employees now serving with the colors.

JAMES V. MCCONNELL, formerly connected with the Western Electric Company at Los Angeles, has enlisted in the Navy Hospital Corps and has gone to the training station at Goat Island, San Francisco.

AUGUST W. PATRICK, employed for several years in the office of the Merchants Heat & Light Company, Indianapolis, Ind., has volunteered for Knights of Columbus work and will be assigned to Camp Logan, Houston, Tex.

FRED COLEMAN, for some time with the Cutler - Hammer Manufacturing Company, Milwaukee, Wis., is now in the service of Uncle Sam and is stationed at the Electrical School, Naval Operating Base, Hampton Roads, Va.

DR. MILLER REESE HUTCHINSON, chief engineer at the laboratories of Thomas A. Edison, Inc., West Orange, N. J., has resigned to devote his entire time to his duties as a member of the Naval Consulting Board and other Government work.

W. D. MYERS, of the commercial department of the Louisville Gas & Electric Company, Louisville, Ky., has accepted a position with the Louisville War Industries Commission and will represent the commission in Washington in an effort to direct war material contracts towards Louisville's industries.

ADIRONDACK ELECTRIC POWER COMPANY, Glens Falls, N. Y., has already filled one service flag with 32 stars and has started another with three stars to date. Those who have most recently entered the service are Adrian Trousegaard, who has entered the Marines and is stationed at Paris Island; Donald Demiott, of Saratoga, stationed at Spartanburg, and Earl Sizer of Oneida.

P. B. FINDLEY, technical editor in the Department of Publicity of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has resigned from that position to enter the training school at the University of Pittsburgh, where he will take a special course in radio work, with the Signal Corps. Before going to the Westinghouse company, Mr. Findley was editor of the Electrical Age, in which position he made a large number of friends in the electrical field who will wish him success in his military work.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

J. F. NINGARD, of the Baltimore plant of the Chesapeake & Potomac Telephone Company, is now with the United States Marines at Paris Island, S. C.

F. R. CALVERT, formerly superintendent of the electric light plant at Rockville, Ill., has entered army Y. M. C. A. work and will be assigned to duties overseas.

C. L. CLARK, former superintendent of the 13th Street District of the Duquesne Light Company, is now located at Fort Myer, Virginia, as first lieutenant of the 37th Engineers.

E. B. PLAPP, assistant steam heating engineer of the Duquesne Light Company, Pittsburgh, Pa., has enlisted with the 37th Engineers Regiment, Company E, and is now located at Fort Myer, Virginia.

WILLIAM MCDOUGALL, formerly connected with the water softener plant of the Rankin power station of the Duquesne Light Company, recently enlisted in the merchant marine and expects to be called for service very soon.

THE ELECTRIC COMPANY, St. Louis, Mo., in the July number of Wire and Pipe publishes its roll of honor, bearing the names of 182 employees who are serving with the colors. The list gives the name, military organization and addresses where available.

WILLIAM LESLIE EDISON, a son of Thomas A. Edison, the inventor and honorary chairman of the Naval Consulting Board, has enlisted in a tank division of the United States Army. Mr. Edison will be stationed at Camp Colt, Gettysburg, Pa.

E. A. WEST has resigned his position as chief engineer of the Denver Tramway Company, Denver, Colo., to take charge of the Department of Transportation and Housing of the U. S. Shipping Board Emergency Fleet Corporation on the Pacific, with headquarters at San Francisco.

K. W. GRAHAM, manager of the Fremont Gas, Electric Light & Power Company, recently resigned to enter naval service.

WILLARD B. FELTON, first engineer of the Arkansas Valley Railway, Light & Power Company's Pueblo, Colo., plant, has joined the U. S. Marines.

WHITFIELD FORD, superintendent for the Morris County Traction Company, Dover, N. J., for the past ten years has associated with the Electric Railways Advertising Company, Scranton, Pa.

H. M. JONES, former local manager of the Pacific Power & Light Company at Lewiston, Wash., is now on the firing line in France. Mr. Jones has been commissioned an officer, having the title of captain.

VAN ENGEL, formerly connected with the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is now in San Antonio, Tex., at an aviation camp where he is on special duty at headquarters as a medical corporal.

CHARLES GILMAN HYDE, professor of sanitary engineering at the University of California, who has been commissioned a captain in the sanitary corps of the army, has been granted a leave of absence by the regents of the university.

WALTER S. CHURCH, formerly connected with the Duquesne Light Company, Pittsburgh, Pa., is a member of the 37th Engineers of the United States Army, having recently enlisted in the service of Uncle Sam. He is now located at Fort Myer, Virginia.

LIEUTENANT G. S. WILLIAMS, formerly of the Charleston plant of the Chesapeake & Potomac Telephone Company, has received his commission and is now in the Signal Corps. Lieutenant Williams attended the Third Officers' Training Camp at Leon Springs, Texas, and was recommended for a commission when he completed the course.

G. B. RANDALL, formerly an employee of the county division of the Electric Company, St. Louis, Mo., has recently been promoted to the rank of lieutenant-colonel in the Engineers Corps. Colonel Randall attended the officers' training camp at Fort Leavenworth and is now stationed with the 37th U. S. Engineers at Fort Myer, Virginia.

FRANK BOHNER MACGAFFIC, formerly chief electrician of the Western Reserve Works of the Brier Hill Steel Company, Warren, Ohio, is now stationed in Italy. He is a bugler of Company B, 332nd Machine Gun Battalion, from Camp Sherman, Chillicothe, Ohio. Mr. MacGaffic's home is in Sharon, Pa.

ERNST W. ROTH, formerly Minneapolis manager for the Lindsley Brothers Company, and more recently sergeant in the Ordnance Department in the National Army at Camp Dodge, has been transferred to the Bureau of Standards at Washington, D. C., to engage in research work in the chemical department.

Financial News

Utilities Optimistic Over Increased Wage Policy.

Officials of public utility corporations and owners of the securities of public service corporations have overcome first fears of the announced policy of the War Labor Board to order materially higher wages for employes regardless of the ability of companies to make payment. They conclude that the order would mean receivership for so many utility properties essential to the war program unless increased revenue is provided that federal authority will be exercised in providing an ample increase in rates.

Philip H. Gadsden, chairman of the National Committee of Public Utility Conditions, has indorsed the plea of the utilities that the President exercise his right to fix rates with a view to supply sufficient income to keep the utilities in efficient condition for war purposes. He calls attention to the fact that the unification of all industry in the interest of the war has served to bring out in bold relief how essential the public utilities are in maintaining the energies of the nation in the struggle.

"Upwards of 60 per cent of industrial or factory power is furnished by public utilities," says Mr. Gadsden. "The present supply is now unequal to the demand because of the speeding up of all industries on account of the war.

"It is stated that practically all of the high speed steel (the so-called electric steel) is now manufactured through the medium of electric furnaces which are largely operated with electricity furnished by public utilities.

"By reason of war orders, new industrial centers are being formed to house the army of new workers, thus making tremendous demands on present electric railway systems. Upwards of 80 per cent of the factory employes are now transported daily by the electric street and interurban railroads, these railroads moving approximately 20,000,000,000 passengers annually.

"The public utilities must be relied upon to furnish at least 20 per cent of the toluol necessary for the prosecution of the war. They must furnish important short haul freight service to relieve the congested steam railroad conditions at terminal and industrial centers."

Annual Report of Toronto Hydro-Electric System.

The Toronto Electric Commissioners have submitted the seventh annual report of the Toronto Hydro-Electric System, showing the financial status of the system existing December 31, 1917. At this, the close of over six years of operation, during which time two rate reductions have taken place, it is pointed out that the enterprise has operated at a profit, earning a surplus of $75,819.30. The system has earned sinking funds for the redemption of serial debentures amounting to $744,036.94, net earnings over and above all operating, interest and depreciation charges for the year having aggregated $819,854.24.

The business of the system has undoubtedly been affected by the power shortage, but notwithstanding this fact, the gross income for the year 1917 showed an advance of 20.1 per cent over 1916. While the prices of almost every commodity have advanced to unprecedented levels, the fact that the average charge per kilowatt hour for service supplied by the Toronto Hydro-Electric System has showed but a slight reduction has been most gratifying.

Racine Electric Increases Capital Stock.

The Racine Electric Company has increased its capital stock from $25,000 to $100,000, with 750 shares of common stock and 250 shares of preferred stock at $100 per share. The preferred stock will draw 7 per cent annually. H. Van Bree is president of the company, and John W. Ruggaber, secretary, and acting superintendent of the plant.

Marconi Marine Progress.

Notwithstanding the necessary restrictions in respect of private messages at sea having continued during the past year, preventing receipt of revenue from this source, the Marconi International Marine Communication Company is able to show substantial expansion in business, gross revenue having increased by $1,002,380, as compared with 1916, to $2,353,290, the advance being derived principally from rentals of additional ships fitted. The total number of public telegraph stations owned and worked by the company on the high seas has increased from 1472 to 2265. The organization of the International Marine and its associated companies has a total of 4000 mercantile vessels fitted with Marconi apparatus. The dividend distribution for 1917 is 15 per cent, the same as for 1916.

Dividends.

Public Service Investment Company has declared a quarterly dividend of $1.50 on preferred stock, payable August 1 to stock of record July 17.

Lowell Electric Light Company has declared a quarterly dividend of $2.50, payable August 1 to stock of record July 18.

Edison Electric Illuminating Company of Brockton has declared a dividend of $2.00, payable August 1 to stock of record July 18.

Electric Bond & Share Company has declared a quarterly dividend of 1½ per cent on preferred stock, payable August 1 to stock of record July 17.

Earnings.

COLUMBUS ELECTRIC COMPANY.

The report for April of the Columbus Electric Company and constituent companies for May discloses gross earnings of $94,223, an increase of $10,507. Net earnings for the period were $54,709, compared with $53,966 for the corresponding months of 1917. Interest charges amounted to $28,199, against $24,895 for the same period of the previous year. Balance was $21,912, which compares with $25,723 for May, a decrease of $3810. The twelve months, gross earnings totalled $1,149,762. Balance after expenses, taxes, sinking fund requirements and interest charges was $320,167.

MISSISSIPPI RIVER POWER COMPANY.

Statement of operations for the Mississippi River Power Company for April shows gross earnings of $193,233, compared with $157,594 for the same month of the previous year. After expenses and taxes of $35,770, net earnings of $157,463 were accounted for. Interest and amortization charges of $104,363 were deducted, leaving a balance for sinking fund requirements of $53,099. Gross earnings for the twelve months ended April 30, 1918, totalled $2,073,005, against $1,790,643 for the preceding twelve months. Net earnings amounted to $1,668,775. Balance available for dividends, etc., was $243,711, compared with $141,919 for the corresponding months of 1917, an increase of $101,792.

SOUTHWESTERN POWER & LIGHT.

The report of the Southwestern Power & Light Company for May shows gross earnings of $399,995, compared with $344,399 for the same month of the year previous. Net earnings were $141,895, against $146,100 for May of last year. The 12 months' gross revenue amounted to $4,996,006, an increase of $559,640 over the corresponding period of the previous year. Net after taxes for the period was $2,048,985.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid. July 9.	Bid. July 16.
Adirondack Electric Power of Glens Falls, common	6	15	15
Adirondack Electric Power of Glens Falls, preferred	6	70	73
American Gas & Electric of New York, common	10+extra	80	80
American Gas & Electric of New York, preferred	6	39	39
American Light & Traction of New York, common	..	191	193
American Light & Traction of New York, preferred	6	93½	92
American Fower & Light of New York, common	4	39	39
American Power & Light of New York, preferred	6	66	66
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	20	..
American Telephone & Telegraph of New York	..	96	96¼
American Water Works & Elec. of New York, common	..	4½	4½
American Water Works & Elec. of New York, particip	7	11	11
American Water Works & Elec. of New York, first preferred	..	53	53
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	20	20
Cities Service of New York, common	+extra	207	204½
Cities Service of New York, preferred	6	74¾	74¼
Commonwealth Edison of Chicago	8	100	100¾
Comm. Power, Railway & Light of Jackson, common	..	21	19
Comm. Power, Railway & Light of Jackson, preferred	6	45	40
Federal Light & Traction of New York, common	..	7	7½
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	16	10
Middle West Utilities of Chicago, preferred	6	..	..
Northern States Power of Chicago, common	..	40	40
Northern States Power of Chicago, preferred	ex.div.7	80	81
Pacific Gas & Electric of San Francisco, common	..	35	36½
Pacific Gas & Electric of San Francisco, preferred	6	80	80
Public Service of Northern Illinois, Chicago, common	7	71¾	73
Public Service of Northern Illinois, Chicago, preferred	6	83	82½
Republic Railway & Light of Youngstown, common	4	18	18
Republic Railway & Light of Youngstown, preferred	6	57	57
Standard Gas & Electric of Chicago, common	..	4	4
Standard Gas & Electric of Chicago, preferred	6	20	21
Tennessee Railway, Light & Fower of Chattanooga, common	..	3	3
Tennessee Railway, Light & Power of Chattanooga, preferred	6	14	14
United Light & Railways of Grand Rapids, common	4	29	29
United Light & Railways of Grand Rapids, preferred	6	61	61
Western Power of San Francisco, common	..	13	13
Western Power of San Francisco, preferred	6	49	49
Western Union Telegraph of New York	extra	86	87
Industrials—			
Electric Storage of Philadelphia, common	4	56	53
General Electric of Schenectady	8	146	145
Westinghouse Electric & Mfg. of Pittsburgh, common	+extra	42¼	42
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	60	60¼

*Last sale.